

5. Modulation of autoISF aggressiveness.

V 2.6

Please note that with autoISF 3.0 you are in an early-dev. environment, where the user interface is **not optimized for safety** of users who stray away from intended ways to use. Good safety features exist, but these are only as good as the development-oriented user understands and implements them. This is not a medical product, refer to disclaimer in [section 0](#)



5.1 Automatic modulation of loop aggressiveness

- 5.1.1 “autoISF off” outside of meal times
- 5.1.2 SMB off @ odd profile target
- 5.1.3 SMB off @ odd temp. target
- 5.1.4 diff. of FCL aggressiveness via Automations
- 5.1.5 diff. of FCL aggressiveness via Activity Monitor
- 5.1.6 Pro/con completely hands-off FCL

5.2 Manual modulation of FCL aggressiveness (DIY cockpit)

- 5.2.1 Status recognition
- 5.2.2 Manual interventions from DIY cockpit
 - 5.2.2.1 Temp. %profile or TT settings
 - 5.2.2.2 Temp. settings in /preferences
 - 5.2.2.3 Grey DIY cockpit buttons for FCL responses
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5.3 Manual modulation via improved cockpit

- 5.3.1 Violet FCL icon and underlying buttons
- 5.3.2 Bottom buttons “insulin” etc.
- 5.3.3 Top three fields
 - 5.3.3.1 TT dialogue field
 - 5.3.3.2 Exercise button / dialogue field
 - 5.3.3.3 Profile dialogue field

5.4 Recognizing loop state from the AAPS home screen

- 5.4.1 Color scheme (grey/yellow) of the top 3 fields
- 5.4.2 Info on the top 3 fields (profile, exercise, TT)
- 5.4.3 FCL related indicator fields
- 5.4.4 Overall AAPS home screen

[Available \(related\) case studies:](#)

Case study 5.2: Sweet snack. juice
or Glühwein (5.2.2.3)

Once the initial tuning according to [section 4](#). is done, you are ready to use autoISF for your fully automated meal management.

You will have three major *other* challenges to manage:

- recognize and manage (partial) occlusions, or other technical (CGM or BT related) obstacles (see [section 2](#) on pre-requisites of FCL, and related case studies)
- deal with times when insulin given by the loop must be restricted (e.g. a snack could be “misinterpreted” as a meal)
- deal with times when the loop should be set “milder” as a precaution (e.g. nights; or in an exercise context).

46 How big the remaining challenge is depends very much on your individual lifestyle.

47 [Sections 5](#) and [6](#) discuss this in more detail.

48 **In order to run the loop fully automatically around the clock, the times *outside* the meal**

49 **blocks must also be precisely analyzed, and solutions to problems (if any) must be sought.**

50

51 It is up to every user to decide where to draw the line.

52 • With a technically well functioning system, moderate meals, moderate or no exercise,
53 moderate %TIR expectations and a bit of mindfulness it should be possible to go into **Full**
54 **Closed Loop 24/7**, after working through, and observing, [sections 1-4](#).

55 • Especially if you are a bit shy of using the emulator for really detailed analysis, it is likely
56 that you will not hit *one* real good system calibration ([section 4](#)) for your *entire range* of
57 diets.

58 In that case you will occasionally run out of range, and your options to prevent, react, or
59 improve are

60 ○ accepting a few % higher time outside range for that day (and, if feasible, in the
61 future avoiding what seemed to have caused it)

62 ○ taking a snack (whenever you tend to go low from the “tails” of insulin activity that
63 was required to fight a peak)

64 ○ doing a manual override (if you can think of one in time, to manage the problem
65 manually)

66 ○ temporarily resorting to the well-known hybrid closed loop.

67

68 Instead of accepting such instances, you could launch “improvement projects”

69 • that refine your initial tuning ([section 4](#). and [sections 8-9](#))

70 • that make you and your FCL loop fit to manage an increasing number of disturbances
71 either automatically, or via an “informed”, maybe pre-programmed, user intervention
72 (notably, an exercise “announcement”) ([sections 5-6](#)).

73

74 To tailor the loop's response to disturbances *other-than* your major meals probably will require
75 specific **modulation of the aggressiveness** that you set according to [section 4](#) for your meal
76 management.

77
78 There are many avenues to achieve this. The main ones, that are also easy accessible via
79 Automations in AAPS, are:

80

- 81 • temporary shut-off SMBs (odd-numbered target)
- 82 • temporary reduce bgAccel_ISF-weight
- 83 • temporary reduce iobTH
- 84 • temporary reduce set %profile
- 85 • temporary set higher TT (especially in connection with exercise mode)t

86

87 After set up of your core FCL for fully automatic meal management according to [section 4](#), and
88 some performance monitoring ([section 8](#)) and trouble shooting ([section 9](#)) you probably will identify
89 areas that you like to further improve (notably to cut down the occasional need for snacks in an
90 exercise context).

91

92 In setting up your FCL, you then have another difficult and time-consuming job at hand, to define
93 solutions for any of your „other“ situations (outside of meal management) that tend to drive glucose
94 outside of the desirable range.

95

- 96 • In [section 5.1](#) we explore avenues towards *fully automated* management that in daily life
97 will require no user intervention at all.
- 98 • In [section 5.2](#) and [5.3](#) we will look at solutions that involve an easy *user interaction like a*
99 *data entry or button push*.

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5.1 Fully automatic modulation of FCL aggressiveness

The following subchapters describe set-ups you may want to use for allowing **completely hands-off FCL in as many daily situations as possible.**

5.1.1 autoISF ISF adaptations generally switched off outside of meal-time windows

If, aside from having to bolus for meals, your hybrid closed loop was running pretty well *without* other interventions from your side, you could continue to run in that mode, and just focus your new autoISF FCL on management of meals.

In your initial transitioning phase this approach makes a lot of sense, and even by focusing autoISF on just a sub-set of them, like only dinners.

Also in the long run this avenue is taken by many FCL users for the night times, “hanging on” to their well performing hybrid closed loop with standard `oref(1)` SMB+UAM

For this, you define Automations

- that set meal time windows in which “Enable ISF adaptation by glucose behavior” (autoISF) is turned on in AAPS preferences/OpenAPS SMB
- or: that turn *all* autoISF’s ISF modulations (*or* just `bgAccel_ISF`) off in time windows in which surely no meal occurs. For instance, you can go for all nights back into your Hybrid Closed Loop, as you had before.

Other early DEV AAPS variants (see [section 13.3](#)) all work with meal-time windows. The window is either set by time of day in the settings, or it always must be „set“ by the user via giving a mandatory small pre-bolus before any meal starts. **Outside** of these time windows, these loops then runs with less aggressive SMBs like `oref(1)` SMB+UAM in AAPS Master. This mode is not really FCL, but an advance over traditional HCL that often achieves satisfying degrees of automation and performance.

The term **Meal Announcement** (MA) is often used to label this closed looping mode. Trigger to set a meal time window could also be a pre-bolus given by the user, a carb entry made, an EatingSoonTT set, or a meal announcement button pushed.

136 Note: Outside of the meal time windows you would be in hybrid closed loop. To the extent you
137 rarely face disturbances (aside from meals), you could be looping in full automatic mode around
138 the clock,

139

140 Your temp. "autoISF shut-down" (exiting autoISF FCL = shutting off "Enable ISF adaptation by
141 glucose behaviour") is meant to prevent problems from the loop *over-reacting* to bumps in the
142 glucose curve in times of day (night) when standard oref(1) performance is sufficient.

143

144 A very good alternative to fully resorting to Hybrid Closed Loop is "taming" the FCL via a night time
145 SMB shut-off (see next [section 5.1.2](#)).

146

147 5.1.2 Odd-numbered *profile* targets used to block SMBs

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149 An alternative route of preventing the FCL loop from over-reacting to bumps in the glucose curve
150 would be to make use of the option to temporarily shut down SMBs

151

152 Ensure the even/odd logic in the settings is toggled on in Preferences> openAPS SMB>
153 autoISF settings> smb delivery settings>: "Enable alternative activation of SMB depending
154 on profile target" ON.

155

156 In time blocks with an odd-numbered profile target you can prevent any SMBs being given by your
157 loop. The (unchanged) aggressive settings then can only translate within the limits set by %TBR
158 possible.

159

160 This will very much slow down any more insulin being given, and is an excellent solution for night
161 times, especially if you occasionally experience compression lows.

162

163 Alternatively, you could use the new included options for Automation Conditions and
164 temporarily tune your bgAccel_ISF_weight much lower ([section 5.1.4](#)).

165

166 Yet another alternative was already presented ([section 5.1.1](#)) = to go into hybrid closed
167 loop for the night.

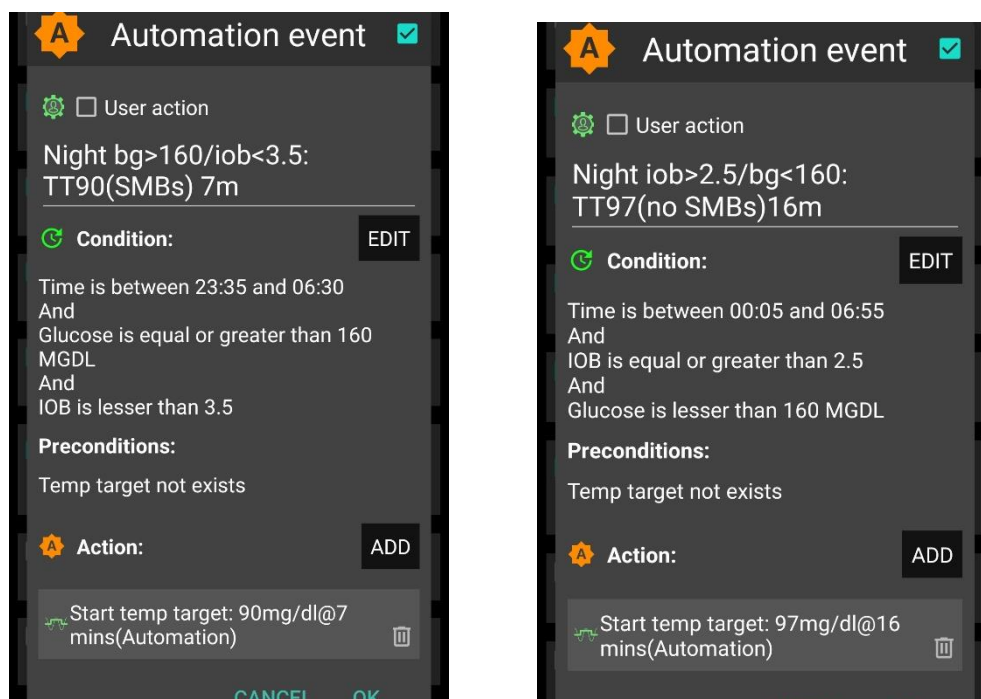
168 That is possible to do with SMBs available (without them getting boosted via autoISF), and,
169 for a long time, was the author's favoured solution for the nights.

170

171 But, my current favourite builds on the method of this section (5.1.2, odd profile target
172 provides SMB shut off), but then allowing some, automatically triggered when needed:

173

174 In case you occasionally do have nights that would benefit from a couple of SMBs (to treat temp.
 175 highs from a late fatty pizza, raclette and such): Define suitable Automations like the two „night“
 176 ones in this *example*:



177
 178
 179 Never underestimate the „trickyness“ of getting your Automations „right“.
 180 With your thought-out Automations in place, night data need to be analyzed to see
 181 • whether the bg and iob limits defined in the given example work sensibly for your data
 182 pattern
 183 • whether the TT duration is chosen appropriately
 184 • how swapping the sequence in which the automations appear in the Automation list would
 185 lead to different SMB impacts.

187 5.1.3 Odd-numbered *temp.* targets (TT) set via Automation used to block SMBs

188
 189 A widely used Action that strongly modifies how fast your FCL can add more iob is setting an **odd-**
 190 numbered **temp. glucose target** which makes the loop operate without giving any SMBs (%TBR
 191 modulation only).

192 Ensure the even/odd logic in the settings is toggled on in Preferences> openAPS SMB>
 193 autoISF settings> smb delivery settings>: "Enable alternative activation of SMB depending
 194 on TempTarget" ON.

195
 196 So, from patterns you find in YOUR data, at times where you want your loop act differently, you
 197 need to carve out Conditions that describe the respective situations (and either *for how long* it
 198 typically lasts, or at which *other* Conditions you want your loop get back to default FCL operation).

199 An odd TT is often set for an *anti-hypo* snack or *sports* snack. In both instances, you do not want
200 SMBs to quickly counter act.

201 In case of sweet “fun” snacks, this is entirely different -> [section, 5.2.1](#) or for regular snacks
202 (e.g. at school break) see next [section 5.1.4](#)

203

204 5.1.4 Automatic differentiation of FCL aggressiveness using Automations

205

206 **Personalized Automations** tailor the loop exactly to **YOUR** data so **fully automated** handling of
207 situations with **different aggressiveness** of the loop can be made.

208

209 From, autoISF 3.0 onwards, also the following parameters are provided as Condition and/or as
210 Action for defining YOUR Automations:

- 211 • Enable ISF adaptations by glucose behaviour => Allows temp. ON/OFF for the key ISF
212 modulation parts of autoISF (and, as a result, will usually decrease loop aggressiveness)
- 213 • Trigger/set iobTH percent => Keeps default aggressiveness, but only until a iob threshold
214 (that your Automation modifies) is surpassed (which is when any further SMBs will be
215 blocked blocked)
- 216 • Trigger/set bgAccel_ISF_weight => Modifies the default aggressiveness of just the
217 acceleration component

218

219 To set up suitable Automations, you first must **analyze patterns** you find in **YOUR data**, at times
220 (or geo-locationa, or bg and iob patterns that point to a problem ...) **where you want your loop**
221 **act differently**, to carve out Conditions that describe the respective situations (and either for how
222 long it typically lasts, or at which *other* Conditions you want your loop get back to default FCL
223 operation).

224

225 A variant of this mode is to define several windows in which autoISF aggressiveness
226 (bgAccel_ISF_weight) and/or iobTH are automatically set differently

- 227 • for **different meal time slots** of your day –

228 (*Breakfast at home, school lunches, school intermission snacks, dinners at home* could for
229 example all deserve special settings regarding ISF_weights and iobTH).

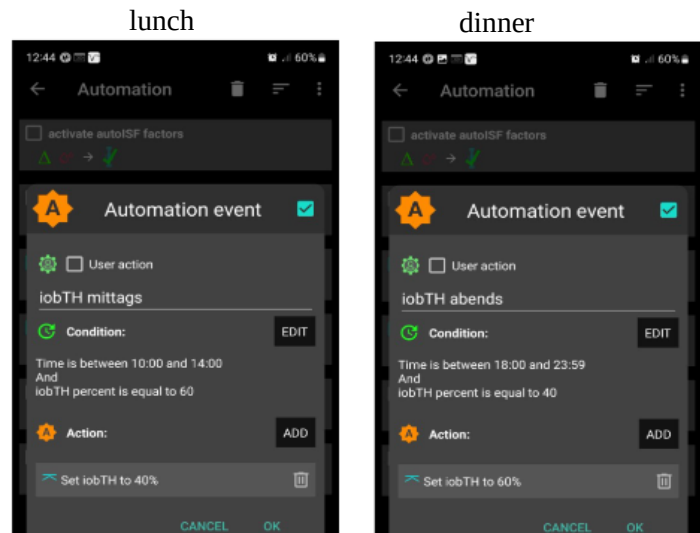
- 230 • or even for a geo-location etc –

231 (*School lunches, or mother-in-law visits, would be examples*).

232 An example for this was given in section 3 already:

Here is an example set of automations to alternate between two values of iobTH:

I use two different values of *iob_threshold_percent* during a normal day. It is 40% for lunch time and 60% for dinner time. I have these two rules to switch by time of day and only if the current value equals the value from the earlier shift. Any other value is treated as a manual override for special occasions until I manually set it to its regular value. The time windows for switching are long enough to catch an opportunity to be processed and do not need to be actioned half a day each.

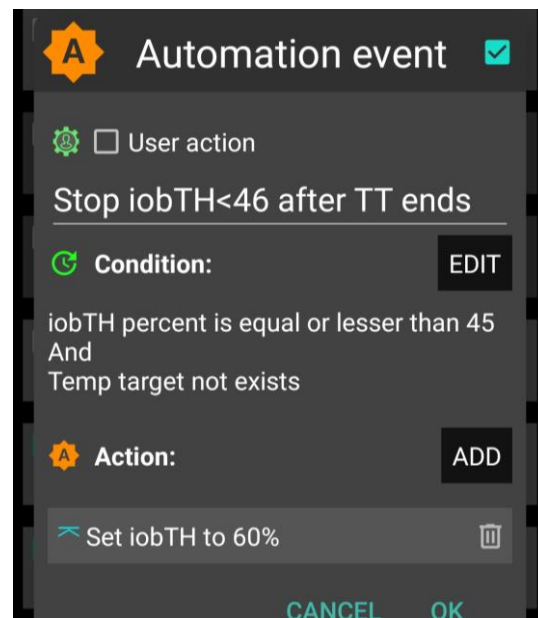


Unless your meals differ vastly in size and in fast carb content all this may not be needed.

Still, personalized Automations might help ease your initial job of setting the various ISF_weights, and a best-suitable iob_theshold_percent that would work “always”.

Caution: If (as in autoISF 3.0) setting a different iobTH or bgAccel_ISF_weight can not be done temporarily (i.e. with a duration attached) you **must** define a suitable **additional Automation**, that must be active in tandem, that **restores the default set iobTH or bgAccel-ISF_weight again**. Else, once your Automation set in, it will *forever* shift this important parameter setting!

If for instance you have several Automations that, in combination with a set elevated TT also set a lower iobTH: Don't be fooled, the duration only applies to the TT. You need an extra Automation for all of them. I picked out the highest of the altered iobTH values that these Automations can set (45_percent), and then I can automatically restore my default desired 60% via this one Automation (see screenshot - - >)



5.1.5 Automatic adjustment of FCL aggressiveness via the Activity Monitor

With the autoISF variant of AAPS you can make use of your smartphone's **stepcounter** and use it to fully automatically adjust insulin sensitivity ratio to **activity level in the past minutes to one hour** time frame.

260 This feature comes with yet another little tuning opportunity, in which you study your body's
261 response to light exercise (like walking) or to not moving at all (like desk, couch), and select
262 appropriate settings which, in the future, will automatically adjust insulin delivery to suit activity
263 state of the past minutes (up to 1 hour).(AAPS Preferences/OpenAPS SMB/Activity modifies
264 sensitivity/ -> set **two scaling factors**.)

265
266 This autoISF feature (new since V.3.0) is much quicker responding than Autosens or dynamicISF
267 to adjust insulin sensitivity to your current „lifestyle state“.

268
269 For loopers who do not have huge variations in exercise levels in their everyday lives, this feature
270 might fairly much close the gap towards being able to do a 24/7 hands-off FCL.

271
272 [Sections 3.5](#) and [6.5](#) describe the Activity monitor in more detail.

273
274 [5.1.6 Pro/con completely hands-off Full Closed Loop](#)

275
276 To stay 24/7 in a completely „hands-off“ FCL can be a realistic goal with autoISF 3.0 if besides
277 meals also some special challenges, as discussed in this [section 5.1](#), were analyzed and could be
278 addressed.

279
280 Clearly it depends very much on your lifestyle, and how interested, willing, and capable you are to
281 recognize, deal with, (and in the future avoid?) situations that get you outside of your desired %TIR
282 on occasion.

283 So, this is also about what %TIR you are aiming at, and can accept, as it averages out for
284 the week, for instance.

285
286 Everybody must weigh for her/himself

- 287
- how much **upfront effort** to put into the setting up process for getting it all 100% automatic
 - **or whether to take an easier start, with a couple of situations left to take care of when and as they arise in daily life**
- 288
289

290
291 Also, even if a principal capability for a fully automatic running FCL is given, this still
292 means that

- 293
- the user should be knowledgeable about what exactly is going on, and
 - have a principal capability to „nudge“, or to take over in a manual mode.
- 294

295

296 In the sections that immediately follow, we present the options to nudge or temporarily take over
297 from the AAPS home screen which will be serving as your **FCL cockpit**:

- 298 • [Section 5.2](#) describes how you can use available “buttons” from your AAPS home screen,
299 and how to complete it towards a suitable DIY FCL cockpit, for an even better FCL
300 experience.
- 301 • [Section 5.3](#) describes how you might be able to manage “disturbances” even better (with
302 more convenience) with an **improved FCL cockpit in the future. (No need to read any of**
303 **the green lines, unless you are interested in contributing to define/design/program further**
304 **improvements)**

305

306 5.2 Modulating aggressiveness manually, from the DIY-FCL-Cockpit*

307

308 * Like in the airplane cockpit: Cruising in full auto mode should involve having an eye on the
309 instruments, and on potential disturbances ahead in the environment.

310

311 In [section 4](#), we dealt with major meals. In [section 5.1](#) we looked into fully automatable manage-
312 ment of other situations. Life in Full Closed Loop can become extremely easy then...

313

314 However: Other **disturbances** might come up, that:

- 315 • are not noticeable in-time, or foreseeable, by the loop (*e.g. your plan to start exercise in an*
316 *hour or two*), but **that influence sensitivity dramatically** and therefore require temporary
317 non-default settings in order to remain in-range, and/or
- 318 • **require** a different “starting point” regarding iob and bg, which translates into **a different**
319 **iobTH** that should **temporarily** be set much lower (*in case of exercise*) or noticeably higher
320 (*e.g. with very fast absorbing carbs in a sweet snack “sin”*) .

321

322 In [section 5.1](#) we looked into ways to automate also a modified loop response to *foreseeable* situa-
323 tions (tied to a time of day, geo-location etc), or to those *the loop could recognize* (with enough
324 time to react).

325

326 Other „disturbances“ might come up, and you must find an easy way to

- 327 • call up a pre-programmed routine for automatic management, with adjusted
328 aggressiveness, or:
- 329 • manually tweak a setting or two, to temporarily adjust the aggressiveness

330 • There may also arise a desire to just exit the FCL mode, and be your own captain for
331 mastering a special situation.

332 For peace of mind, to learn, and to stay informed (especially so in your initial tuning phase, or
333 when your glucose curve goes in unexpected ways) we also must be able to

334 • find the key parameters that frame and drive the recent and upcoming loop decisions.

335
336 All this is facilitated within seconds right from the AAPS home screen, serving as a **FCL cockpit**
337 after you built a couple of DIY cockpit features via Automations (as described below and in [case](#)
338 [studies 5.2](#) and [6.2](#)):

339
340 Thoughts went also into [how to improve the cockpit in future releases](#), see [section 5.3](#)

341

342

343 5.2.1 Status recognition

344

345 Before considering any manual interventions into the ongoing FCL, you should be aware what the
346 current mode of action is, and hence which button eventually to fine-tune or lever to switch, in or-
347 der to adjust to the disturbance you see coming up.

348

349 See [section 5.4](#)

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351 5.2.2 Manual interventions from the (DIY-) FCL cockpit

352

353 Trouble with all these is, not to forget to set back manually, too (=> better solutions in 5.3)

354

355 5.2.2.1 Temporary tuning of FCL aggressiveness via temp. %profile or TT settings

356

357 The set **% profile** multiplies with both, the ISF resulting from autoISF, and also with the default
358 iobTH you have set, so both are nicely modulated in a linear way with the % temporarily chosen

359

360 Just taking profile e.g. to 110% for an afternoon might be an easy way to explore whether
361 you might benefit from 10% more “aggressiveness” in your core settings for lunches (like
362 bgAccel_ISF_weight). Make sure, though, that the extra 10% are not cut away by set safety
363 limits.

364

365 A lowered (relative to profile glucose target) temporary **bg target (TT)** signals lowered sensitivity
366 (more insulin need), and an elevated TT (as often used with exercise) increases sensitivity and
367 hence works in the direction of a lowered % profile to also reduce insulin given by the loop.

368

369 Moreover, the **exercise button** (top center on your AAPS home screen) can be activated (turns
370 yellow, then). This will **further boost** how your set TT elevates the resulting ISF, and sharply
371 lowers iobTH, as often desired for sports. See [section 6.1](#)).

372

373 5.2.2.2 Making temporary changes in settings made in AAPS/preferences/Open APS SMB

374

375 Going into AAPS/preferences/Open APS SMB allows to:

- 376 - set milder or stronger ..._ISF_weights
- 377 - set different iob_threshold_percent (or iobMAX)
- 378 - elevate or lower the SMB_delivers_ratio
- 379 - limit or expand max. allowed SMB size
- 380 - change the the even <-> odd logic for SMB on/off

381

382 Doing temporary changes in AAPS/preferences should be the exception because

- 383 - they require multiple steps, including entering a password
- 384 - you will often forget to set everything back to default a couple of hours, or minutes, later

385

386 5.2.2.3 Triggered Automations: Grey extra DIY cockpit buttons for pre-programmed “responses”

387

388 Recognizing conditions for fully automatic handling by the loop may not be not possible, or come
389 too late for the loop to act on. Examples would be

- 390 • *exercise*: Minimum an hour before starting “the loop should know” to be able to lower iob
391 and elevate bg by the time exercise starts.
- 392 • *snacks*: High carb snacks, sweets, consuming ice cream or having a sweet drink comes
393 with the problem of even steeper glucose rises, but overall a lesser insulin need, compared
394 to major meals (for which we tuned our FCL according to [section 4](#)).

395

396 This not necessarily implies that snacks need different settings than a meal. After all, autoISF
397 was designed to act to all available data, especially to where the developing glucose curve is
398 headed. So, depending on your effort to set parameters for a broad variety of meals (notably:

399 how well you avoid to invariably bounce fast against your iobTH), you might be able to accom-
400 modate low carb, snack, and major meals with *one* set of settings.

401

402 In FCL autoISF, this is a bit more difficult than in HCL autoISF applications, because FCL
403 involves revving up iob supply (largely via big bgAccel_ISF-weights) often too much to be
404 balanced by just a snack getting absorbed.

405

406 For that reason, or just for increased comfort and safety, you might want to differentiate, and make
407 use of what follows for the *sweet snack* example.

408

409 **Tuning aggressiveness**

410 Key is that a sweet snack likely benefits from even more aggressive initial FCL
411 performance than the meals in your normal spectrum of diets require.

412 Therefore, you could set

- 413 • a higher **temp. profile%** and/or
- 414 • a temp.elevated **bgAccel_ISF-weight** (see screenshot of my Automation).
- 415 • a **low temp. target** (76 for instance; this additionally helps maximize the first SMBs
416 that will automatically be triggered at detection of acceleration)..

417

418 When first defining and testing this Automation, also check:

- 419 • that the safety limits as discussed in [section 2](#) will not block the intended elevated
420 aggressiveness
- 421 • SMBs will not get outrageously big and iobTH sometimes exceeded by too much

422 Note that “the last SMB” is allowed to overshoot the effective iobTH by 30%

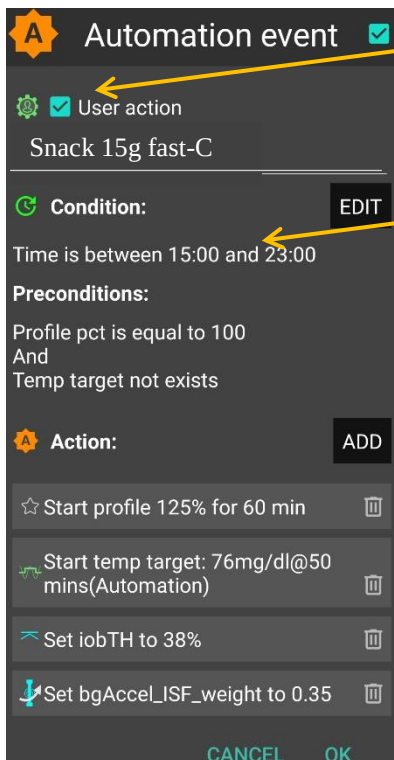
423

424 **Limiting iob**

425 For “just a snack”, total insulin need will be lower than for a meal.

426 If you would just have your sweet drink, and your meal-oriented FCL would “attack”,
427 iob likely would become too high, and a glucose rollercoaster would start, with you
428 needing to consume more =>

429 If you just have a snack, or drink a glass of juice, you can lower the **iobTH_percent**
430 accordingly.



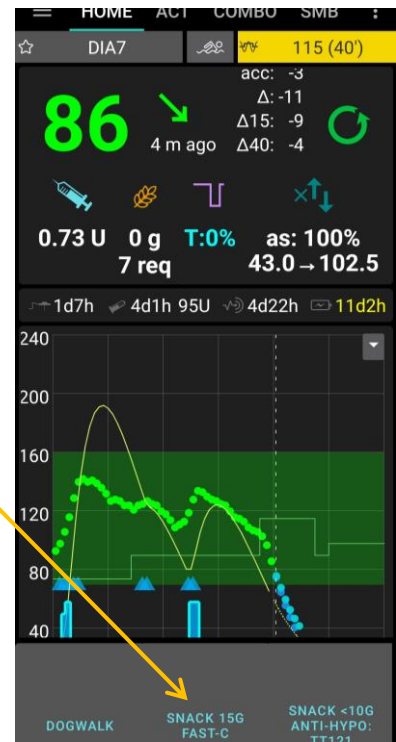
„User action“ is always ticked-on

This will, in the defined time space ..

..offer the “DIY cockpit” button..

..which I must press any time (~90...30 minutes) before my snack.

Note: Make sure that iobTH and bgAccel_ISF_weight revert to default afterwards



431

432

433 So, this can be a little extra “project” when setting up your FCL.

434 You need to research your snack habits (if any), and over time find out which settings in
435 the snack-related Automations work well.

436

437 In everyday life you then just must press the related button in your cockpit (which is
438 not time critical at all, except it should be clicked *latest* a couple of minutes after you took
439 the drink or snack).

440

441 If you consume more, and also eat something with your sweet drink, this will more
442 resemble a full meal... however, with unusual amounts of fast carbs.

443

444 Note: Pressing your snack button a *second time* would **not** help because the
445 lowered iobTH does not allow iob going high enough. So you are better off just
446 letting your normal FCL meal routine run, after your snack mode expired.

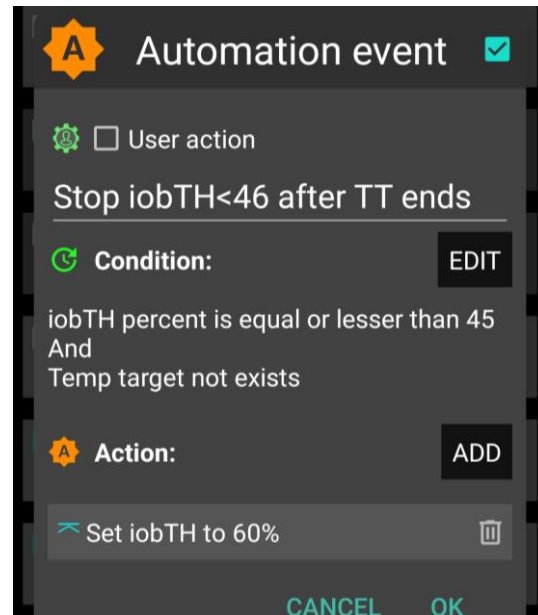
447

448 Other options when snacks keep extending would require a manual modulation
449 regarding %profile and/or bgAccel_ISF, but keeping the full default set
450 iobTH_percent, or even elevating it (refer to [section 5.2.3](#)). If that happens often,
451 define for yourself an extra User action Automation for a bigger snack (= another
452 grey DIY cockpit button).

453

454 **Caution:** If (as in autoISF 3.0) setting a different iobTH or bgAccel_ISF_weight can not be done
455 temporarily (i.e. with a duration attached) you **must** define a suitable **additional Automation**, that
456 must be active in tandem, that **restores the default**
457 **set iobTH or bgAccel-ISF_weight again**. Else, once
458 your Automation set in, it will *forever* shift this
459 important parameter setting!

460 If for instance you have several Automations that, in
461 combination with a set elevated TT also set a lower
462 iobTH: Don't be fooled, the duration only applies to
463 the TT. You need an extra Automation for all of them.
464 I picked out the highest of the altered iobTH values
465 that these Automations can set (45_percent), and
466 then I can automatically restore my default desired
467 60% via this one Automation (see screenshot - - >)



468

469 Installing the DIY cockpit button

470 In the related Automation, just keep the "User action" box clicked at all times, and define in
471 the Conditions when you want to see that button available for cockpit use (see screenshot
472 above) => you will see that button offered.

473

474 Besides snacks, also any **other recurring special situations can be addressed via a**
475 **DIY cockpit button, and receive different aggressiveness up to a suitable iobTH**
476 **level.**

477

478 Over time you can have a big number of User action Automations, and keep them
479 "shelved" rather invisibly (clicked in-active, top left box) in your long list of potential
480 Automations. Even when active, they only show in your cockpit (bottom grey field of your
481 AAPS home screen) in the time slot you assigned as potentially relevant.

482

483 In the future you might be able to set the stage for a snack and other "disturbances"
484 also via an extended menu behind the TT button on the AAPS home screen, see
485 [section 5.3.3.1](#)

486

487 Discussion

488 In case you do have a snack habit and

489 • can not find settings, as in [section 4](#). defined for your meals, also suit your snacks

490 • can not pin a as in [section 5.1.4](#)

491 you minimum need a “snack announcement”

492

493 5.2.3 Temporarily exiting the FCL

494

495 The “last resort” alternative always is to **temporarily** leave the FCL mode, and handle any
496 disturbance “the traditional way” in **hybrid closed loop**. For this, we switch the automatic
497 aggressive adaptations of ISF to the bg curve off that are only needed in FCL

498 (if in hybrid closed loop you like e.g. the dura_ISF adaptation still, you alternatively

499 could elect to just set bgAccel_ISF_weight temp. to zero, instead)

500 ... and now around meal starts giving a bolus will be necessary.

501

502 The suggested improved FCL cockpit user interface with an extra version of violet loop on
503 the AAPS home screen ([section 5.3.1](#)) would facilitate this transition FCL < - > HCL,
504 including automatic removal and re-appearance of the insulin button at the bottom of the
505 APS home screen.

506

507 In case [this feature](#) is not yet available, you must:

508 Exit the FCL mode by going to AAPS/preferences/put in your password/OpenAPS SMB/scroll down
509 to autoISF settings and switch “Enable ISF adaptation..” OFF

510 (or, alternatively, set bgAccel_ISF_weight to zero).

511

512 **Caution:** Unfortunately, there is no way yet for your full closed loop with ISF adaptations to come
513 automatically back on, after a selected time for instance. So do not forget to switch your autoISF
514 fully back on, later.

515

516 As this will often be forgotten, it may be worth doing a “User action” Automation, for a “temp.
517 FCL OFF” grey button (see [section 5.2.2.3](#)).

518 Caution though, there is very limited experience with this brand new feature. Make sure your
519 Automation definition really applies a duration (or other condition) that will automatically
520 terminate all non-default settings it made. As we have seen e.g. in [section 5.1.4](#), this is not
521 always the case.

522

523 To recognize whether autoISF currently runs with ISF adaptation or not, you must consult the
524 profile_sens -> actual_sens indicator below the Autosens%. However, this gets also modified
525 by %profile switches or TT +/- exercise mode. So it is not as easy as it would be with the “violet
526 loop” proposal mentioned already above.

527 Ultimately, you can of course study the SMB tab to find out what is going on.

528 529 530 5.3 Modulating aggressiveness manually from the improved FCL-cockpit 531 532

533 autoISF 3.0 is an early dev variant of AAPS, and as user you are participating in an on-going
534 development. Of note, autoISF 3.0 is first launched without many of the cockpit features that are
535 presented below in this font color.

536
537 Only what is written in black is at this point of some relevance for using autoISF 3.0.

538 **No need to read** any of the green lines, unless you are interested in contributing to
539 define/design/program further improvements.

540 This is also an open invitation for you to contact us in case you could help program a
541 module for one of the suggested user interface extras.

542 For future integration into AAPS Master, an eye should be kept also on the question which
543 other modes (like FCL using Automations and others mentioned in [section 13](#); and maybe
544 also HCL) might benefit from some of the extra features.

545 For the time being, multi-step work-arounds may become necessary

- 546 • In many cases, going into AAPS Preferences and changing settings would be needed
547 (...plus not forgetting to change these settings back, afterwards).
- 548 • Automations allow a DIY FCL cockpit, see [section 5.2](#) and [case studies 5.2](#) and [6.2](#)

549
550 Keep in mind, though, that the **goal should be to interfere with the loop as little as possible**.

551 Under the described conditions it can run **fully automatically** without any user interaction (= after
552 the initial tuning phase, and related settings made in AAPS /preferences/SMB/autoISF. See [section](#)
553 [4](#). and [5.1](#)).

554
555 However, just like in the airplane cockpit: Cruising in full auto mode should involve having an eye
556 on the instruments, and on potential disturbances ahead in the environment.

557 *E.g.: storm ahead => instruct your plane to climb to another flight height.*

558 *Analogy: exercise ahead => setting an exercise TT, or => pressing a button that activates a*
559 *sequence of instructions (some of them probably hinging on conditions, like actual iob) how*
560 *to manage through that exercise situation).*

561

562 So, for the occasional „disturbance“ coming up, you should find an easy way to

563 • call up a pre-programmed routine for automatic management, with auto-adjusted
564 aggressiveness, or:

565 • tweak a setting or two, to temporarily adjust the aggressiveness

566 • There may also arise a desire to just exit the FCL mode, and be your own captain for
567 mastering a special situation.

568 All this is facilitated within seconds right from the AAPS home screen's **cockpit features** to the

569 **extent they are already incorporated**, or to the extent you can build alike DIY cockpit features via

570 Automations, as described in [section 4.1.3](#) and [case studies 5.2](#) and [6.2](#)):

571

572 • The button that is integrated into the **violet FCL icon** serves as emergency off button, to
573 quickly stop FCL, or to at least to immediately stop any more SMBs (...just for a couple of
574 minutes, or for the remaining meal time: pick from the options offered with just one
575 keystroke).

576 Via the violet FCL icon on your AAPS home screen, you also can access a temp. switch-off
577 button for SMBs (see section that next follows below).

578

579 • The **three top fields** (%profile, exercise, TT) provide access to temp. tuning of core
580 parameters, and/or to some pre-programmed routines.

581 Taken together with some **new indicator fields** about your loop state ([section 5.4.3 – 5.4.4](#)), and

582 the **grey DIY cockpit buttons** ([section 5.2.2.3](#)) this makes the AAPS home screen your **cockpit**

583 for Full Closed Looping.

584

585 Let us look on each of these cockpit elements in some detail:

586
587 5.3.1 Violet FCL icon and underlying buttons

588

589 Novices to FCL, or really anyone running into a very special situation, may appreciate that the new
590 closed loop icon on the AAPS home screen in pink (for FCL) has buttons to quickly shut off getting
591 more SMBs (1st row), or to enter other loop modes (second row).

592

593 It functions very much as the other ones that you know from HCL already, and in fact you
594 get offered some of the same options (for instance, to switch the (full) closed loop off for 15
595 minutes for going to take a shower)

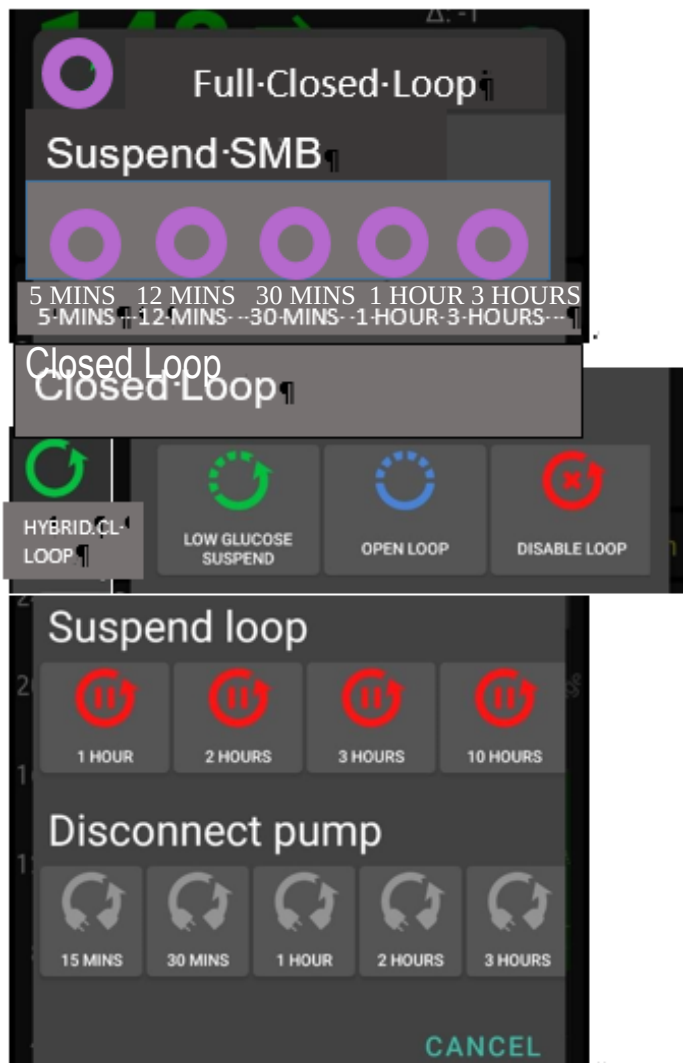
596

597 Note that in FCL you leave all BG regulation, notably against meal spikes, to the loop. So, try not to
598 disconnect in phases when your FCL must ramp up your job.

599 The required insulin would still be supplied *after* you reconnect. However, without the user
600 pre-bolussing, the delay would be more of an issue in FCL than it had been in HCL.

601

602 Just pressing on the FCL icon, a dialogue box comes up:



<-add-arrow, form-like-like-CL-Loop...

<-dotted+arrow, form-like-like-LGS...

DEV: when in Hybrid-Closed-Loop = top headline + green circle, there is no Suspend-SMB part but it starts right with „Closed-Loop“. In that screen. There, the 1st element must be option to pick.

.....pink circle, FULL-CL-LOOP.

where here the green HYBRID-CL-LOOP stands.

For loopers who did not set up FCL, a feedback must come up ~ „FCL not installed“ if they press on that button.

603

604 Pressing „**Suspend SMB**“ provides fast and easy „emergency braking“ regarding delivery of more
605 SMBs:
606 Select the one with the desired number of minutes: 5 or 12 for just blocking the potential next
607 SMB(s), and up to 3 hours to manage the entire rest of this meal with %TBR from then on.
608
609 Whenever, and why-ever, your FCL is in „no SMBs allowed“ mode (e.g. automatically after
610 surpassing an iobTH, or triggered by a set odd TT), the FCL icon will turn into a dotted one.
611 Instead of remaining **duration to end time** it indicates in the middle „the condition“, „**iob**“ or „**TT**“
612 Add an indication **if** suspend SMB comes from an Automation, e.g. add an „**(A)**“, **underneath** the
613 #minutes, iob, or TT in the middle of the dotted violet field.
614 So, as in other (already in HCL existing) cases, those icons show in the middle the minutes left that
615 they will be running, or the condition which would have to go away for this temp. setting to stop.
616 It always auto-reverts into the FCL state and FCL icon, when time (or other condition) has elapsed.
617
618 Pressing „**HYBRID CL. LOOP**“ or other buttons from the 2nd row provides fast and easy
619 „emergency **exit**“ **into other modes**.
620 This enables beginners an easy „temp. escape“ into their well-known HCL (green) at any
621 point of time. bgAccel_ISF_weight is set to zero when going FCL->HCL. HCL can run with
622 autoISF (for instance dura_ISF) uninhibited otherwise. (check **implications** for HCL users of
623 autoISF ??).
624 Note: These options from row 2 have no time limit. Loop will **not** by itself go back to FCL. You see
625 the different loop icon as a reminder to manually revert, when ready.
626
627
628 5.3.2 Buttons „Insulin“, „Calculator“ etc at bottom of AAPS home screen
629
630 These buttons are **not useful any longer in FCL**, and automatically disappear whenever in FCL
631 mode (also in Suspend SMB state), and re-appear when leaving FCL. This applies also when an
632 Automation or technical system failure shut off FCL.
633 Users who, maybe in the beginning phase, feel better having those buttons, can override
634 the removal (of the insulin button, or any other) by going into /preferences/overview/buttons
635 and forcing them on. They only remain on until the next re-entry into FCL mode, when auto-
636 off happens again.
637 The reason why we do this: It really is important to let the loop loop, and not interfere more
638 than absolutely needed. Any bolus the user gives will sure distort the bg curve, on which
639 autoISF, especially when aggressively tuned for FCL, builds a lot of its decisions!

640

641 5.3.3. Three top fields (%profile, exercise, TT)

642

643 Depending on the variedness of lifestyle, the desired %TIR, and the initial tuning effort put in, the
644 user may want occasionally to „tweek“ the aggressiveness of her/his FCL.

645

646 The top 3 fields (grey in default mode, **yellow when temp. in mode with changed**
647 **aggressiveness**) serve as quick and easy entry points to make temp. switches (as users will be
648 used to for %profile switches, or for setting an EatingSoonTT in HCL, .. which they still can do in
649 FCL ... but more:)

650

651 Expert FCL users might need this feature rarely, but probably at least to manage activity after
652 meals: Each require opposite aggressiveness, and the switch has to come in a certain point in
653 time that would be difficult to capture. (More see [section 6.4](#))

654
 655 5.3.3.1 TT dialogue field (Currently not available in the pictured form and function !)
 656
 657 The TT field (top right of AAPS home screen) is a primary daily interface, and a dialogue field
 658 opens when pressing on it

Initially, the form can be entirely empty re. TT inputs and just show the default iobTH and bGAccel parameters.

Two lines appear for target and get labeled ES, AC or HY depending on what was pushed at the bottom buttons. (HY => red frame; evtl. 1. empty => grey)

TT entries can be made or overridden.

iobTH calculates from Target AC and other settings shifts away from default set in /preferences (here 0.7) but could be overridden here 0!..200 % is allowed

bGAccel ISF_weight can be modulated here, too. Note: it can change again if % profile is also changed. -- 0...200 % is allowed

CANCEL allows to start fresh (select one or two of the square buttons, ES, AC or HY)

OK needed to use the settings

Duration input is made in minutes. In the exceptional case that both, ES and AC targets are defined, the duration input is pr AC and framed blue. (This is because the preceding AC mode is automatically determined in length by the loop observing when iobTH is exceeded)

659
 660
 661 This looks complicated but only because it allows 4 different modes of use. Each user will primarily
 662 use her/his preferred one.
 663 (1) Who is happy with the initially well tuned FCL and does not have huge variations in daily eating
 664 and moving around, will **not use** the TT **at all**. FCL is possible without an intervention via the

665 TT button in your cockpit. Actually 4 of 8 modes (GGG ...YYY permutations, list see [section](#)
666 [5.4.1](#)) are not making use of TT.

667 (2) Super easy is also, to just input **any odd-TT** (odd-numbered temporary target) that will shut out
668 any SMBs for the set duration. *That can be a good idea when having a small snack, for*
669 *instance.*

670 Super quick access to stop SMBs is possible also via the loop icon ([section 5.3.1](#)).

671 Specifically, an **EatingSoon TT** can be activated here (limited relevance see [section 2.5](#)). It is
672 time-un-critical, can be manually set, or come up via an Automation.

673 The cockpit enables you to set the iobTH differently (override) for the current meal.

674 Alternatively, iobTH can be temporarily changed in /preferences or using an Automation.
675

676 Temp. iobTH will always revert to default when the TT expires. If another TT immediately
677 follows, like in the example of the screen above, it will calculate, (then) show and use a new
678 temp. iobTH.

679 (3) The third way is to **use the input mask** (if already ncluded in your software version see picture
680 above) **to freely modulate the loop aggressiveness** for a declared number of minutes. Click
681 the bottom big square(s): Either HYPO, or ACTIVITY, or EATING SOON, or ACTIVITY and
682 EATING SOON (example in the pictured screen above). Make or override entries in the offered
683 fields. Press OK.

684 (4) The fourth way is to exclusively use one of the 4+4+2 little buttons seen in the bottom part of
685 the TT dialogue box (if already included in your software version). They provide a set of
686 settings (as will immediately show in all input fields above) that the user has set up in
687 Preferences/SMB/autoISF/FullLoop (refer to [section 6.3](#)), and can freely label there. *For*
688 *instance „hiC“ at high carb EatingSoon, „piz“ for Pizza/fatty meals, „grd“ for garden work,*
689 *„mtb“ for mountain biking ...*

690 **Capturing good settings for not-everyday situations in /preferences** (if already included)
691 **allows calling them up within 1 second**, from your cockpit on the AAPS home screen (...and
692 won't ruin the FCL experience at all , especially because in most cases it is not time-critical,
693 how long before the intended exercise the buttons are pressed).

694 [Case study 6.2](#) demonstrates that nearly the same performance and comfort can be reached
695 via the **DIY FCL cockpit** with the grey extra buttons appearing at the bottom of the AAPS home
696 screen, based on Automations with User action (see also [section 5.2.2.3](#)).

697 The example picture given above, and also [case study 6.2](#), is the most complicated (but also most
 698 useful) case, **when exercise follows after a sizeable meal**. It is then that you need (a) aggressive
 699 FCL initial performance at the meal, but, *exactly when* (!) a (for the intended sport already
 700 temp.lowered) *iobTH* is exceeded, you need (b) to have SMBs automatically switched off and go
 701 into the „milder“ mode, as defined for the exercise (with *high* instead of the immediately prior
 702 *low*TT, that automatically significantly reduces iobTH again, and insulin sensitivity(resistance)
 703 settings too).

704
 705 Pressing exercise related buttons will automatically also light the **exercise button** on the main
 706 screen yellow.

707
 708 To summarize, the TT dialogue field offers easy but powerful ad-hoc [modulation of loop](#)
 709 [aggressiveness](#) for FCL (if already included).

710

711

712 5.3.3.2 Exercise button (see more in [section 6](#).)

713

714 The exercise button automatically lights yellow when exercise related TTs are activated [in the TT](#)
 715 [dialogue box](#).

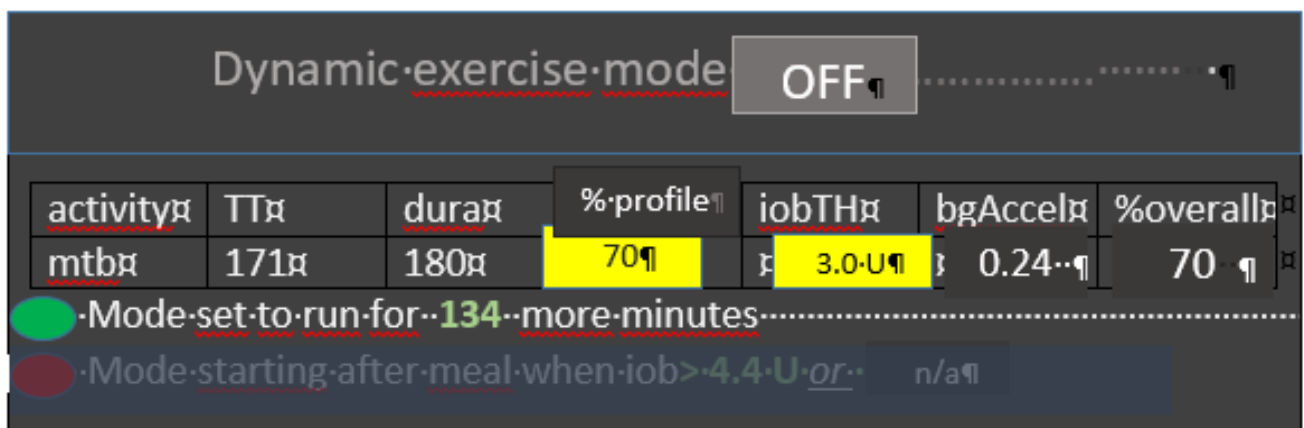
716 4 of 8 principal FCL modes ([section 5.4.1](#)) are making use of the exercise button.

717

718 If pressing on the exercise button, a dialogue box appears (*if extended design for FCL cockpit is*
 719 *already launched*) with info on exercise setting first (and opportunity to override), plus below the
 720 activity monitor (experimental for auto-tracking of lighter movement during the day, and effects on
 721 sensitivity that may have. See [section 4.5](#)).

722

723 So, first the exercise settings (as set under TT) are there to read. Example :



724

725

726 The exercise (here mtb) is selected in the dialogue box of the neighboring TT field, and there auto-
727 filled with settings made in the set-up and tuning stage by the user under preferences (see
728 above,...). They are reported also under the exercise button here, and TT, duration, and % sens
729 (which also shows active on the %profile field on the left side of the exercise button) can be temp.
730 changed there. iobTH, bgAccel_ISF and overall resulting sensitivity ratio is given in the other fields.
731 The **middle field** of the table, „% profile“ either picks up the % set under the %profile button, or
732 an input can be made here, in the exercise button domain, which will:

- 733 • turn the neighboring %profile button on yellow and show that inputted % on it, too
- 734 • be multiplied with the result from the exercise mode settings per se, and change the %
735 overall, accordingly.

736 So, if this middle field of above table (dialogue box of sports button) contains a figure other than
737 100, input field becomes yellow, and you are operating with a combination of traditional PLUS new
738 exercise mode (with all three top buttons of your FCL cockpit yellow). This maximally will soften
739 aggressiveness, for which you get an idea by the last calculated figure.

740

741 The mode is either running already (for another number of minutes, as probably also shown in the
742 yellow TT field anyways). Or it is scheduled to run, after insulination for a started meal reaches
743 iobTH (as in table). Or, no exercise is scheduled (both points red, no entries).

744

745 The lower part of the exercise dialogue box (not pictured above, but see in [section 6.5](#)) is
746 dedicated to the Activity Monitor

747

748 5.3.3.3 Profile button

749 The profile button can still be used to set a different profile, or profile%, for instance to adjust for
750 days with sickness (as you are used to from hybrid closed looping). 4 of 8 modes are not making
751 use of the profile button.

752

753 Any inputs made here will be used to modify profile_ISF on which all further changes are made on
754 (multiplied with).

755

756 The profile field remains grey if standard profile is applied.

757 It turns yellow, displaying a %figure relating to any altered loop overall aggressiveness:

- 758 • When no inputs (changes from 100% profile) are made here, but inputs in the TT field,
759 e.g. for exercise, automatically lead to different insulin sensitivity ratio ~~that ratio is shown~~
760 here
- 761 • when% is changed by input in the profile button itself, it will be multiplied with with
762 profile_ISF and be used in place of profile_ISF *by the algorithm*.

763 However, for exercise (sports) you no longer must make an entry here, because
764 reasonable %reductions should be automatically provided, driven by your set TT (and half-basal
765 exercise target), see [section 6](#).

766

767 5.4 Recognizing your loop state in the AAPS home screen

768

769 5.4.1 Color scheme of top cockpit buttons tells kind of closed loop that is running

770

771 3 Buttons (%profile; exercise; TT) each in 2 states (yellow Y, or grey G) make $2 \times 3 =$
772 **eight principal FCL modes** possible:

773

774 GYY = dynamic exercise mode

775 YGY = not-dynamic „traditional“ exercise mode (if <100%) or hypo mode (if >100%)

776 GYG = **basic closed loop with Activity Monitor running**

777 (Note: activity monitor on/off set in preferences will **not** affect the button color in **autoISF V.3.0**; you may
778 recognize Activity monitor is running by the indicated adaptation of sensitivity despite no TT or temp% are set)

779 GGG = basic closed loop (FCL or HCL) without any altered sensitivities etc

780 YGG = basic closed loop but with a „long wave“ sensitivity shift (e.g. sickness)

781 GGY =temp. target like e.g. EatingSDoonTT is set; or Hypo mode

782 YYG = closed loop with „long wave“ sensitivity adjustment and Activity Monitor running

783 YYY = dynamic exercise mode in time with additional „long-waved“ sensitivity shift

784

785 5.4.2 Information printed on the top buttons

786

787 The yellow TT field shows **the currently valid TT** (and further duration):
788 (profile) stands for the abbreviation you labeled your selected running profile



789

790 In the special case of settings for meal preceding sports, the field will look slightly differently:



791

...and ...

792 ... when iobTH is first time exceeded, this automatically switches to:



793
794

795 Likewise, if on the AAPS main screen just an **EatingSoonTT** is set (e.g.72), this is entered with the
796 desired duration. Afterwards, it automatically reverts to profile target and the display turns grey
797 again there with e.g. 90 on it (and no time limit).
798 Without sports context, the middle field remains grey.



799
800

801 Independently from setting a TT, the user can choose to set a **%profile in the left top field**, for an
802 independent number of minutes, e.g. 70% in this screen example: Also, or additionally, this will
803 influence the resulting ISF and sensitivity%

804



805
806

807 The % might change and turn yellow also in context of making TT inputs in the related dialogue
808 box (see chapter TT dialogue field, above). Still, the % (or the length of time the profile switch shall
809 be active) can be independently overridden in the top left field, if so desired.

810

811 If an **Automation** sets a %profile, and/or a TT (e.g. *automatic detection of meal start at condition*
812 *e.g. when delta >10*) , this would automatically show in respective field(s) turning yellow and
813 showing the temp. setting. To show the set parameter comes from an Automation, „ **(A)** „ is added
814 in the end of button text.

815 Note that an Automation is **usually/ always (?)** only permitted to temp. change default profile
816 settings, not other pre-existing temp. settings. This is for a good reason : Why should a
817 sometimes in the past thought-out Automation supersede your - just for the occasion
818 specified – temp.settings that you consciously activated for the day?

819 Advice: Try to stay away from Automations that also aim at temp. modifying
820 aggressiveness. For the reason just given in above note, they often will not kick in anyways.
821 Generally, it also is no good idea to double up sub-algorithms for tweaking loop behaviours.

822

823 Also, as pointed to above twice already:

824

825 Try to **keep things as simple and clear as possible**.

826

827 That said, a limited number of Automations can be of help in distinct scenarios (that differ in
828 purpose and in applicable time of day).

829 A good one could be for night time, when your odd profile TT has SMBs shut off, but your
830 experience after pizza nights tells you that, under certain condition patterns (bg, iob), an
831 SMB or two should be „allowed in“ (see example given in [section 5.1.2](#)).

832 Another good example, if you go usually FCL without any use of the TT button (which would
833 be a meal announcement of sorts), is to define an Automation that, after detecting a meal
834 start, automatically sets a low TT to get maximally aggressive first SMBs (as is the author's
835 preferred way, mentioned already in [section 2.5](#)).

836

837 5.4.3 FCL related indicator fields in the AAPS home screen

838

839 In extra data fields of the AAPS main screen you can always see (not change) the key
840 „aggressiveness“ parameters your loop currently operates with (see also home screen
841 example below):

842 • how profile sensitivity (**ISF**) changes by the %profile input, by autoISF, and/or a set
843 exerciseTT.

844 • next to current available iob number is an indication of your **valid iobTH** (the iob above
845 which no more SMBs will be given)

846 • The AAPS home screen additionally shows, above the deltas, the current **acceleration**

847 Having a look at that can be valueable. For instance, when glucose is relatively low and still
848 falling, a positive (and getting more positive) acceleration indicates that bg will swing back
849 up, rather than crash low. This will give info about necessary snack size, and hence help
850 avoid both, unnecessary calories, and going on a bg rioller coaster.

851
852
853 5.4.4 Overall home screen:
854

Overall home screen:



855
856
857