

5. Modulation of autoISF aggressiveness.

V 4.3.1 w/new texts, line~488

Please note that with autoISF 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/readme.md](#)



5.1 Automatic modulation of loop aggressiveness

- 5.1.1 “autoISF off” outside of meal times
- 5.1.2 SMB off @ odd profile target
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- 5.1.4 diff. of FCL aggressiveness via Automations
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 - 5.4.3.3 Profile dialogue field

Skip what is in green writing:

= Drafted fragments or not implemented ideas. Read only if you like to participate in discussion – Suggestions will probably be radically reduced because FCL *can and should* be done *without* most discussed extra features

Available (related) case studies:

Case study 5.2: Sweet snack.

Case study 5.3: Compression low

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

Challenges beyond managing main meals

There are up to four *other major challenges* you might have to manage:

1. Secure the technical pre-requisites for your FCL remain a given (see [section 1](#)):
 - Prevent, recognize and manage (partial) occlusions (=>frequent cannula changes)
 - Secure “meaningfulness” of 100% all your CGM values

- 49 ○ Secure 24/7 BT connectivity of all your components
- 50 2. Deal with times when insulin given, after meal detection, must be restricted, e.g.:
- 51 ○ a snack should not be “treated” as a meal
- 52 ○ meal before exercise should not be treated “all the way” towards high iob.
- 53 3. Deal with times when the loop should be set "less aggressive" as a precaution, e.g.
- 54 ○ during nights
- 55 ○ in an exercise context
- 56 4. Deal with times when the loop should be set "more aggressive" e.g.
- 57 ○ at sickness
- 58 ○ at tempting hotel breakfast buffet

59 How big the remaining challenge really is, depends very much on your individual lifestyle.

60

61 Hands-off FCL – an elusive goal?

62

63 To run the FCL “hands-off” around the clock, you now must analyze also **your** data in the times
64 *outside* the meal blocks, and seek solutions to problems (if any).

65 With a technically well-functioning system, moderate meals, moderate or no exercise, moderate %TIR
66 expectations and a bit of mindfulness it should be possible to go into **Full Closed Loop 24/7**, after
67 working through, and observing, [sections 1-4](#). See [case study 4.3](#).

68

- 69 • In [section 5.1](#) we explore avenues towards **fully automated** management that in daily life will
70 require no user intervention at all.

71 Often it will be **your** choice whether you want to bother with researching in **your** data for, and
72 defining, dedicated (“personalized”) Automations (see also [section 5.1.6](#)). Or whether you accept
73 instances, where you do manual steps:

74

- 75 • In [section 5.2](#) (and later, related to exercise, in [section 6](#).) we will look at solutions that involve
76 an easy **user interaction** like a data entry, or a button push.

77

78 Avenues for temporary modulation of the FCL aggressiveness

79

- 80 1. temporary shut-off SMBs (odd-numbered target)
- 81 2. temporary change bgAccel_ISF-weight

- 82 3. temporary change iobTH_percent
- 83 4. temporary change the set %profile
- 84 5. temporary set different bg target (especially in connection with exercise mode)t

85 All of these are also easy accessible via Automations in AAPS

86 This means: If, in **your** data, you find sets of conditions where any of the actions 1.-5. could
87 help, you can make this aspect integrated part of **your** hands-off FCL!

88

89 Note that in Automations you can go beyond above mentioned 5 avenues, and come up with a
90 nearly surgical definition as to from which iob on, and many other criteria, some temporary
91 modulation of aggressiveness shall happen.

92

93 5.1 Fully automatic modulation of FCL aggressiveness

94

95 The following subchapters describe set-ups you may want to use for allowing **completely hands-**
96 **off FCL** in as many daily situations as possible (and potentially all the time, as in [case study 4.3](#))

97

98 5.1.1 All autoISF ISF adaptations switched off outside of meal-time windows

99

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

103

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

106

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

109

110 For this, you define Automations

111

- 112 • that set meal time windows in which “Enable ISF adaptation by glucose behavior” (autoISF) is
113 turned on in AAPS preferences/OpenAPS SMB
- 114 • or: that turn *all* autoISF's ISF modulations (*or just bgAccel_ISF*) off in time windows in which
115 surely no meal occurs.

116 For instance, you can go *for all nights* back into your Hybrid Closed Loop, as you had before.

117

118 Your temp. "autoISF shut-down" (exiting autoISF FCL = shutting off "Enable ISF adaptation by
119 glucose behavior" in AAPS Preferences / SMB) is meant to prevent problems from the loop over-
120 reacting to bumps in the glucose curve in times of day (night), when standard oref(1) performance
121 is sufficient.
122 A very good alternative to defining "meal-time windows", or to resorting to night-time Hybrid Closed
123 Loop, is letting the autoISF FCL run 24/7, and "taming" the FCL via a night time SMB shut-off (see
124 next [section 5.1.2](#)).

125

126 *Off topic: **Other "early dev" AAPS variants** (see [section 13.3](#)), do require working with meal-time*
127 *windows. The window is either set by time of day in the settings, or it always must be „set“ by the user.*
128 *Trigger to set a meal time window could be a pre-bolus given by the user, a carb entry made, an*
129 *EatingSoonTT set, or a meal-announcement-button pushed (none of these things are required in*
130 *autoISF FCL).*
131 *Outside of these time windows, these loops then run with less aggressive SMBs, just like oref(1)*
132 *SMB+UAM in AAPS Master, with or without (modified versions of) dynamicISF. So, outside of the meal*
133 *time windows, you would be in "your normal" hybrid closed loop.*
134 *The term **Meal Announcement** (MA) is often used to label this closed looping mode.*
135 *It is not really FCL, but an advance over traditional HCL.*

136

137 [5.1.2 Odd-numbered profile targets, to block SMBs](#)

138

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

141

142 Ensure the even/odd logic in the settings is toggled on in Preferences> openAPS SMB>
143 autoISF settings> smb delivery settings>: "Enable alternative activation of SMB depending
144 on bg target": ON.

145

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

149

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

152

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

155

156 The same situation can be achieved if you generally operate with a mild bgAccel_ISF, and make
157 your autoISF only really aggressive for meal-time slots (if you have similar enough times every day,
158 or also can “employ” geo-fencing in your Automation (or middleware, in iAPS) conditions).

159 In these cases you would not need to have night profiles that disable SMBs: - Which is the better
160 way would depend on a lot of personal factors relating to how high-carb the diet is, regularity of
161 meals, snacking habit, CGM quality and incidence of compression lows, and probably more. - I
162 would try both routes, or, as this is fairly complex to tune, just one, and stick with what is working
163 good enough.

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

166 That is possible, with SMBs available (without them getting boosted via autoISF), and, for a
167 long time, was the author’s favored solution for the nights.

168 This solution is evidently similar to the prior discussed one, of having a mildly tuned autoISF
169 24/7, boosted to high aggressiveness only in meal-time slots.

170

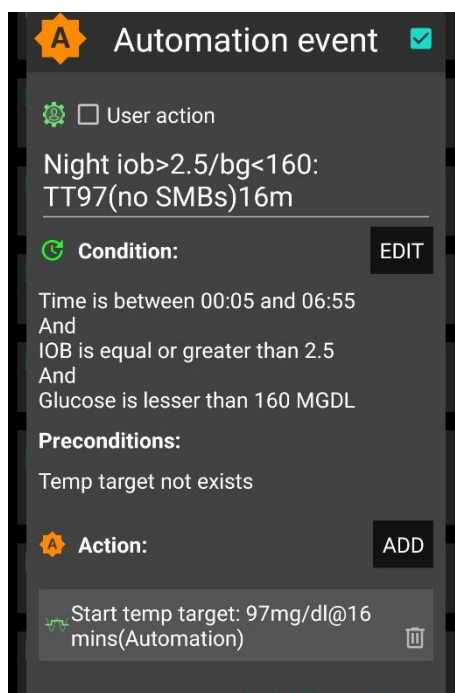
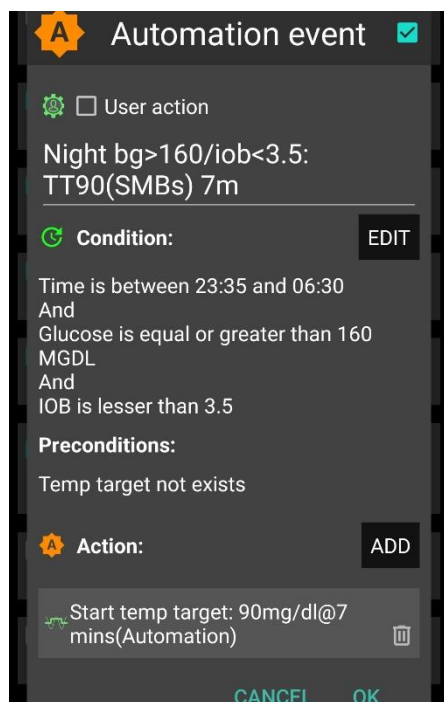
171 [Adjunct Automations to allow a few SMBs, in nights with odd profile target SMB shut-out](#)

172

173 My current **favorite** builds on the **method** of this section (5.1.2, odd profile target provides SMB
174 shut out), but then allowing some, automatically triggered SMBs, when needed:

175

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



179

180

181 Caution: Never underestimate the „trickiness“ of getting your Automations „right“.

182

183 With your thought-out Automations in place, night data need to be analyzed to see

- 184 • whether the bg and iob limits, as defined in the given example, work sensibly four your data
185 pattern
- 186 • whether the TT duration is chosen appropriately
- 187 • how swapping the sequence in which the automations appear in the Automation list would
188 lead to different SMB impacts.

189

190 5.1.3 Odd-numbered temp. targets (TT) set via Automation, to block SMBs

191

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

195 Ensure the even/odd logic in the settings is toggled on in Preferences> openAPS SMB>
196 autoISF settings> smb delivery settings>: "Enable alternative activation of SMB depending
197 on bg target": ON.

198

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

202

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

205

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

208

209 5.1.4 Automatic differentiation of FCL aggressiveness using Automations (or middleware)

210

211 **Personalized Automations** tailor the loop exactly to **your** data so **fully automated** handling of
212 situations with **different aggressiveness** of the loop can be made.

213

214 Automations are an integrated and very easy-to-use feature in AAPS.

215 (The i-Phone platforms Trio or iAPS lack this feature. However, so-called **middleware** has been
216 developed as add-in to your code, see: <https://github.com/macconnellk/RoboSurfer/tree/main>)

217 .

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

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

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

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

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

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

Note: Circadian differences in insulin sensitivity between meal times are included via your ISF profile and should not be a reason for different _weights needed between meals!

- or even for a geo-location etc –

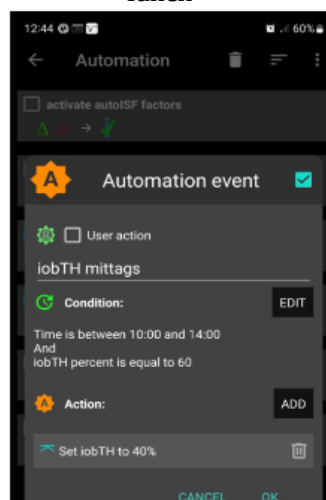
(*School lunches, or mother-in-law visits, would be examples*).

An example for this was given in section 3 already:

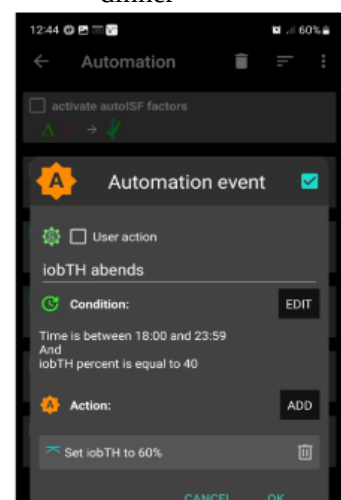
Here is an example set of automations to alternate between two values of iobTH:

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.

lunch



dinner



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

245

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

248 Note: Only the main two parameters (bgAccel_ISF_weight for “initial aggressiveness”, and
249 iobTH_percent for “where SMBs stop”) are available in Automations. So, finding your
250 parameter sets *for each of* the time slots, will not be trivial. => **Spending more effort to set**
251 **the .._weights so they accommodate just one, broader spectrum (section 4.) should be**
252 **the first, and standard, approach.**

253 An intermediate (maybe only temporary) approach could be to use a profile switch (for low
254 carb meal, or eating half, setting %profile to 60% for instance, and only for the brief, less
255 than an hour, initial meal period). See [section 5.2.2](#) and [5.4.5](#)

256

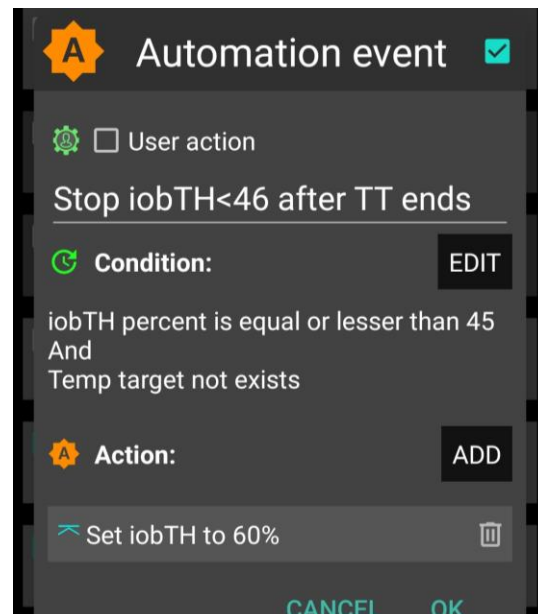
257 **Caution:** Setting a different iobTH% or bgAccel_ISF_weight can probably not be done with a
258 duration attached. Then you **must** define a suitable **additional Automation** that must be

259 active in tandem, to **restore the values you had set**
260 **in /Preferences for your iobTH% or bgAccel-**
261 **ISF_weight.** Else, once your Automation set in, it will
262 *forever* shift these important parameter settings!

263

264 If for instance you have several Automations that, in
265 combination with a set elevated TT also set a lower iobTH:
266 Don't be fooled, the duration only applies to the TT. You
267 need an extra Automation for all of them.

268 I picked out the highest of the altered iobTH values that
269 these Automations can set (45_percent), and then I can
270 automatically restore my default desired 60% via this one
271 Automation (see screenshot - - >)



271

272 5.1.5 Different FCL aggressiveness set by the Activity Monitor

273

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

277

278 This feature comes with yet another little tuning opportunity, in which you study your body's
279 response to light exercise (like walking) or to not moving at all (like desk, couch), and select
280 appropriate settings (in AAPS Preferences/OpenAPS SMB/Activity modifies sensitivity/ -> set **two**
281 **scaling factors**).

282 This **will automatically adjust insulin delivery** (basal, ISF, and iobTH; see 1st screen of AAPS
283 SMB tab (example in [section 5.4.5](#))), to suit activity state of the past minutes (up to 1 hour).

284

285 This autoISF feature (new since V.3.0) is much quicker responding than Autosens or dynamicISF
286 to adjust insulin sensitivity to your current „lifestyle state“ (if it is largely (in-)activity related, which
287 often is the case).

288 For loopers who do not have huge variations in exercise levels (for which they would need the
289 exercise mode) in their everyday lives, the Activity Monitor might fairly much close the gap towards
290 being able to do a 24/7 hands-off FCL.

291

292 The Activity monitor is described in more detail on page 9 of the [autoISF Quick guide](#)
293 (<https://github.com/ga-zelle/autolSF>) and in [section 6.6](#)

294

295 While the Activity Monitor takes automatic care of *light* deviations from an average activity level,
296 exercise enthusiasts, or heavy workers, should make use of the “*heavier tools*” (which
297 automatically supersede (shut off) Activity Monitor: *Exercise mode*, discussed in [section 6.](#))

298

299 [5.1.6 Pro/con completely hands-off Full Closed Loop](#)

300

301 To stay **24/7** in a **completely „hands-off“ FCL** can be a realistic goal with autoISF, if besides
302 meals also some special challenges, as discussed in this [section 5.1](#), were analyzed and could be
303 addressed. Example see in [Case study 5.3](#).

304

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

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

310

311 Everybody must weigh for her/himself

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

315

316 Even if a principal capability for a fully automatic “hands-off” running FCL is given, this still
317 means that

- 318 • the user should be knowledgeable about what exactly is going on, and

319 • have a principal capability to „nudge“, or even to completely take over, in a manual mode.

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

322
323 [Section 5.2](#) describes how you can use available “buttons” from your AAPS home screen to
324 manually “nudge” aggressiveness of your FCL.

325
326 [Section 5.3](#) will show how you recognize FCL state (aggressiveness) and understand recent loop
327 decisions

328
329 **No need to read section 5.4, unless you are interested in contributing to define/design/program**
330 **further improvements). Ideas for an improved FCL cockpit in the future (probably an over-design; I**
331 **intend to reduce to a few “really nice to-have” features)**

332 •

333 5.2 Modulating aggressiveness **manually**, from the DIY-FCL-Cockpit*

334

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

337

338 In [section 4](#), we dealt with major meals.

339

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

343

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

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

351

352 *In these scenarios*, you must find an easy way to

- 353 • call up a pre-programmed routine for automatic management, with adjusted
354 aggressiveness, or:

- manually tweak a setting or two, to temporarily adjust the aggressiveness
- There may also arise a desire to just exit the FCL mode, and “be your own captain” for mastering a special situation.

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

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

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

5.2.1 Status recognition

Before considering any manual interventions into the ongoing FCL, you should be aware what the current mode of action is (refer to [section 5.3](#)), and hence how you might be able to “nudge” your loop in order to adjust to the disturbance that you see coming up.

5.2.2 Manual interventions from the (DIY-) FCL cockpit

Caution: Trouble with some of these is, not to forget to stop and set them back, manually, too.

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

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

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

A lowered (relative to profile glucose target) temporary **bg target (TT)** signals lowered sensitivity (more insulin need), and

An elevated TT (as often used with exercise) increases sensitivity and hence works in the direction of a lowered % profile to also reduce insulin given by the loop.

Caution: In preferences/SMB..., make sure you set “High TT raises...” and “Low TT lowers sensitivity”.

391 Moreover, the **exercise button** (top center on your AAPS home screen) can be activated (turns
392 yellow, then). This can *) **further boost** how your set TT elevates the resulting ISF, and sharply
393 lowers iobTH, as often desired for sports. *) see below in [section 5.3.2](#).

395 5.2.2.2 Making temporary changes in settings made in AAPS/preferences/Open APS SMB

396
397 Going into AAPS/preferences/Open APS SMB allows to:

- 398 - set milder or stronger ..._ISF_weights
- 399 - set different iob_threshold_percent (or iobMAX)
- 400 - elevate or lower the SMB_delivery_ratio
- 401 - limit or expand max. allowed SMB size
- 402 - change the the even <-> odd logic for SMB on/off

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

- 404 - they require multiple steps, including entering a password
- 405 - you will often forget to set everything *back to original* settings, a couple of hours (or already
- 406 minutes) later.

408 5.2.2.3 Triggered Automations: Grey extra DIY cockpit buttons for pre-programmed “responses”

409
410 Recognizing conditions for fully automatic handling by the loop may not be not possible, or come
411 too late for the loop to act on. Examples would be

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

419
420 This not necessarily implies that snacks *need* different settings than a meal. After all, autoISF
421 was designed to react to all available data, especially to where the developing glucose curve is
422 headed. So, depending on your effort to set parameters for a broad variety of meals (notably:
423 how well you avoid to invariably bounce fast against your iobTH), you might be able to accom-
424 modate low carb, snack, and major meals with *one* set of settings.

425

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

In case a snack did trigger a “full meal response”: (1) You probably must continue snacking to prevent a hypo from your initial FCL over-reaction. (2) For future days, analyze your data (and snacking habit) to define how to prevent this from happening often.

For increased comfort and safety, you might have to differentiate, and make use of what follows for the *sweet snack* example, [case study 5.2](#).

Note that in the iPhone versions of autoISF (**Trio** and **iAPS**) there are no Automations . Instead you need so-called **Middleware**, like for instance suggested for %sensitivity (profile ISF) adaptation by one user here: <https://discord.com/channels/953929437894803478/1025731124615458848/1238099464531611668>

Tuning aggressiveness

A sweet snack likely benefits from even more aggressive initial FCL performance than set for the meals in your normal spectrum of diets.

Therefore, you could set

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

When first defining and testing this Automation, also check:

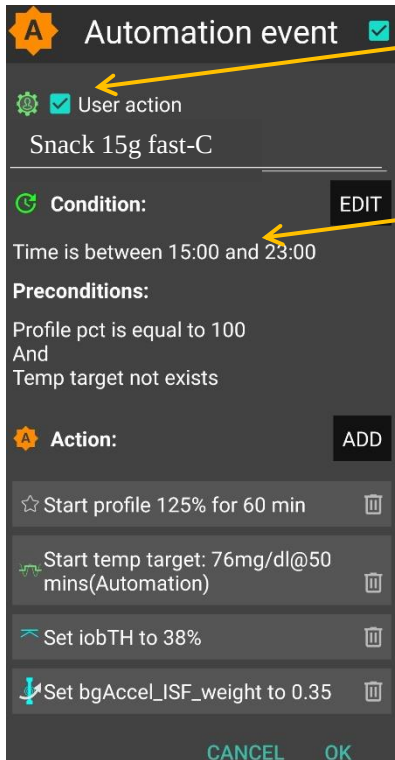
- that the safety limits as discussed in [section 2](#) will not block the intended elevated aggressiveness
- SMBs will not get outrageously big, and iobTH sometimes exceeded by too much.

Note that “the last SMB” is allowed to overshoot the effective iobTH by up to 30%, where it will be cut ~~(or by up to 20% at even target > 100 mg/dl).~~

Limiting iob

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

461 If you would just have your sweet drink, and your meal-oriented FCL would “attack”, iob
 462 likely would become too high, and a glucose rollercoaster would start, with you needing to
 463 consume more =>
 464 If you just have a snack, or drink a small glass of juice, you can lower the **iobTH_percent**
 465 accordingly.



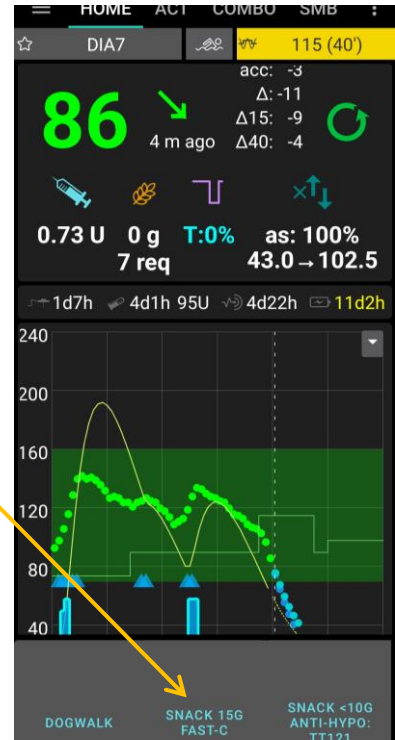
„User action“ is always ticked-on

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



466
 467
 468 So, this can be a little **extra “project” when setting up your FCL.**
 469 You need to research your snack habits (if any), and over time find out which settings in
 470 the snack-related Automations work well.
 471
 472 **In everyday life you then just must press the related button in your cockpit** (which is
 473 not time critical at all, except it should be clicked *latest* a couple of minutes after you took
 474 the drink or snack).
 475
 476 If you consume more, and also eat something with your sweet drink, this will more
 477 resemble a full meal... however, with unusual amounts of fast carbs.
 478
 479 **Caution:** Pressing your snack button a *second time* would **not** help because the lowered
 480 iobTH does not allow iob going high enough. So you are better off just letting your *normal*
 481 FCL meal routine run, after your snack mode expired.
 482

Developers feedback re. the **option to automatically block out** using the same User Action Automation a second time within, say, 2 hours:

1) In the tandem Automation, [line 508](#), add an ACTION for 120 minutes setting ("value") for parameter ("whatever") (= whatever does not hurt your looping, or block any of your other potentially important other Automations)

Caution: Better **not** use a TT for your ("whatever") 1) because of the even / odd SMB shut-out 2) in case you have Automations that demand a clean slate regarding no TT set, better use any other parameter from the long list that is given to choose from, when you set up Automations.

Setting a 105% profile, for 2 hours, might work, for instance. **Note:** Whether this really is a good idea also for you to pick for ("whatever"), depends very much on your other Automations, and loop settings.

2) To the User Action Automation, [line 465](#), add as an additional CONDITION: ... ("whatever"...) is NOT ("value" what you set it to block out 2 hours

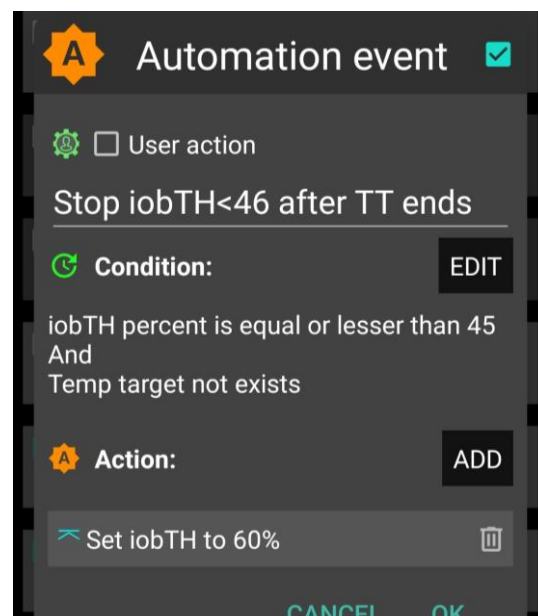
In case you chose 105% profile for your ("whatever"): additional CONDITIONS would be: ... AND Profile pct is lesser than 105 OR Profile pct is greater than 105

⇒ At 105% profile, which gets set (for the 2 hours block-out period) by your other Automation, you cannot activate a (would-be 2nd) User Action "snack" Automation.

Other options (when you just can't stop snacking) would require a manual modulation regarding %profile and/or bgAccel_ISF, but keeping the full default set iobTH_percent, or even elevating it (refer to [section 5.2.3](#)). If that happens often, define for yourself an extra User action Automation for a bigger snack (= another grey DIY cockpit button).

Caution: Setting a different iobTH or bgAccel_ISF_weight can not be done with a duration attached. Hence you **must** define a suitable **additional Automation**, that must be active in tandem, and **restores the iobTH or bgAccel-ISF_weight** in AAPS/Preferences. Else, once your Automation set in, it will *forever* shift these important parameter settings!

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 - - >)



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

521
522 Besides snacks, also any **other recurring special situations can be addressed via a DIY**
523 **cockpit button, and receive different aggressiveness up to a suitable iobTH level.**

524
525 Over time you can have a big number of User action Automations, and keep them “shelved” rather
526 invisibly (clicked in-active, top left box) in your long list of potential Automations. Even when active,
527 they only show in your cockpit (bottom grey field of your AAPS home screen) *in the time slot you*
528 *assigned* as potentially relevant (and if all other conditions are met).

529

530

531 Discussion

532

533 In case you do have a snack habit and ...

- 534 • can not find settings, as in [section 4](#). defined for your meals, also suit your snacks
- 535 • can not pin a time slot or other Condition to it for programming an Automation response
- 536 as in [section 5.1.4](#)

537 .. then you minimum need a “snack announcement” for which the extra button in your DIY cockpit
538 provides a time-uncritical 1-button-push solution.

539

540 This could be a good solution for kids in kindergarten, too. Make sure caregivers
541 understand to use it *only once* for *one* snack. Continued snacking would require iob as for a
542 meals. This is what the FCL loop takes care of automatically; **using the snack button**
543 **several times in a row would limit iobTH at a too-low level!**

544 In a software update, we might try to automatically block usage of that type of
545 Automation for 2 hours, after it was once used.

546

547 5.2.3 Temporarily exiting the FCL

548

549 The “last resort” alternative always is to **temporarily** leave the FCL mode, and handle any
550 disturbance “the traditional way” in **hybrid closed loop**.

551

552 For this, we switch the automatic aggressive adaptations of ISF to the bg curve OFF that are only
553 needed in FCL

554 (if in hybrid closed loop you like e.g. the dura_ISF adaptation still, you alternatively could elect
555 to just set bgAccel_ISF_weight temp. to zero, instead)

556

557 Do not forget that, before meal starts, giving a bolus will then be necessary again.

558

559 The suggested improved FCL cockpit user interface with an extra version of violet loop on the
560 AAPS home screen ([section 5.4.1](#)) would facilitate this transition FCL < - > HCL, including
561 automatic removal and re-appearance of the insulin button at the bottom of the APS home screen.

562

563 In case this feature is not yet available, you must:

564 Exit the FCL mode by going to AAPS/preferences/*put in your password* *)/OpenAPS

565 SMB/scroll down to autoISF settings and switch "Enable ISF adaptation.." OFF

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

567 **) if you set a short password (recommended!) to avoid accidental clicks*

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

571

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

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

578

579 To recognize whether autoISF currently runs with **ISF adaptation** or not, please consult the
580 **"ai: %" indicator** below the Autosens% **on the AAPS home screen.**

581

582 From autoISF 3.0.1 onwards, there is also a very easy way to see effective ISF and effective iobTH
583 in the 1st screen of the **SMB tab**. At the same time, there you see the adaptation of sensitivity to:

584 • a set %profile change (or effect from Autosens, in case you have that activated)

585 • a set temporary target

586 • the Activity Monitor

587 • +/- exercise mode

588 So, occasionally (especially in your early set-up phase, after starting of a meal) it is a great idea to study the
589 SMB tab to find out what is going on. See example given in [section 5.3.6](#)

590

591 5.3 Recognizing your loop state in the AAPS home screen

592

593 5.3.1 Modulated loop aggressiveness via the 3 top buttons in the AAPS home screen

594

595 3 Buttons (%profile; exercise; TT) allow temporary modulation of aggressiveness (sensitivity) as
596 may be needed e.g.

- 597 • going into meals (EatingSoonTT => providing lower bg “starting point” and more pos. iob),
- 598 • or doing exercise (Exercise mode, limiting basal, iob etc for hypo prevention).

599 ,

600 All buttons grey (GGG) indicates: The loop is running using un-modulated profile parameters

- 601 • Note that features like autoISF might still build on profile (regardless whether original, or a
602 temp. modulated profile) for further modifications (See calculation cascade for used
603 sensitivity (sens) in the SMB tab. Example see below in [section 5.3.6](#)).

604 Any **yellow** (y or Y) button indicates you are running with a modified (*e*levated, or **l**owered) **profile**
605 **sensitivity**.

606 *Actually, the middle button could be yellow without being active, see table below*

607

	Less aggressive loop = more sensitive user needs temp. less insulin	Standard loop using the set profile	More aggressive loop = less sensitive user needs temp. more insulin
% profile	under 100 % (y)	= 100% (G)	above 100% (Y)
Exercise button	ON (y) Note that it will only work in combination with elevated TT	OFF (G) <i>If ON (y), it is <u>not</u> active but ready to automatically become active whenever any TT above target is set (e.g. by any Automation)</i>	OFF (G)
TT	above profile target (y)	= profile bg target (G)	below profile target (Y)
Example	Exercise mode with weakened %profile, yyy		EatingSoonTT, GGY
..used e.g. in :	Case study 6.2 (yyy)		Case study 6.2 (G_Y via Automation) Case study 5.2 (YGY)

608 [Case study 6.2](#) uses extremes from both ends of this sensitivity modulation spectrum:

- 609 • yyy for reducing basal and iob, and getting weaker ISF, during exercise
- 610 • GGY for temporary “EatingSoonTT” boost when, in FCL, a high carb meal had
- 611 • The even stronger YGY case is contained in [Case study 5.2](#), where for a high carb snack an extra boost,
612 using >100% profile sensitivity, is temp. added

613

614

615 5.3.2 Color scheme of top cockpit buttons tells kind of closed loop that is running

616

617 3 Buttons (%profile; exercise; TT), each in 2 states, yellow (for modified), else: grey (G)

618 Note that yellow could be less (y) or more (Y) aggressive than standard profile

619 Any yellow setting modulates sensitivity *or attempts to modulate, whenever another required condition*

620 *may become true (e.g. also via an Automation*

621 *Note, though, there are EXCEPTIONS (see below, under GGG, and under Gyy) where sensitivity*

622 *is auto-adjusted without the user, or an Automation, making a different setting on any of the 3 top*

623 *buttons. Autosens, or the Activity Monitor, can adjust the %profile sens without the top left button*

624 *turning yellow or showing that %value. (See sens field in AAPS main screen, or SMB tab!)*

625

626 • GGG is the loop running with set profile.

627 EXCEPTION: If the Activity Monitor or Autosens are running, profile sensitivity could be

628 adjusted to (in)activity despite the %profile button remaining grey (see top of SMB tab text

629 from AAPS main screen).

630 Likewise, Autosens can temp. tweak the set profile, with the button still remaining grey,

631

632 Overall, 2 exp 3 = **eight principal FCL modes** are possible. They need to be **differentiated**

633 **further**, based on whether the modulation...:

634 • ...goes into the **more aggressive (Y, higher % and/or lower TT)**, *or...*

635 • ...the *less aggressive (y, lower % and/or higher TT and evtl exercise)* direction.

636 • Note the **Exercise button** works only one way, to make the loop less aggressive ("y").

637 However, whether the dynamic Exercise Mode (which strongly can adjust sensitivity, see

638 [section 6.1.3.1](#)) is at work, **cannot** be recognized by the color of the Exercise button:

Dynamic Exercise Mode (dyn.EM) ?	bg target as in profile: grey	TT > profile target set (Yellow)
Exercise : grey	dyn.EM off	dyn.EM off
Exercise: yellow	dyn.EM off (!) but "on in waiting" = after an Automation sets a TT>profile target	dyn.EM on

639

640 DEV idea: Should we make the **Y** to violet or orange (more aggressive) and keep the **y** yellow (less aggressive
641 than profile)? Then beginners would easier recognize whether they go more or less aggressive ...

Color combinations	Lower aggressiveness	Higher aggressiveness
GGG		profile	
Gyy GyY	dynamic exercise mode (if TT > profile target)		EatingSoonTT (as TT < profile target: middle y inactive, GyY = GGY 2)
	EXCEPTION: Profile sensitivity is auto-adjusted in dynamic exercise mode, but this leaves the 1 st button grey (G)		
yGy-yGY- YGy-YGY	„traditional“ exercise mode (if <100% sens AND TT > profile target)	mixed cases 1)	boosted EatingSoonTT (if >100% sens AND TT < profile target)
GyG		GyG = GGG 2)	
yGG YGG	Loop adjusted for period of lower insulin need (e.g. 80% for night after exercise)		Loop adjusted for period of increased insulin need (e.g. 120% during sickness)
	The set %profile might be further adjusted by Activity Monitor or by Autosens		
GGy GGY	Loop running with temp elevated target e.g. for enhanced safety against going low (HypoTT)		EatingSoonTT (if TT < profile target)
yyG YyG	same as yGG	y inactive 2)	same as YGG
yyy - Yyy- yyY- YyY	dynamic exercise mode further modulated by <100% profile	mixed cases 3) yyY = yGY, 2)	Boosted EatingSoonTT (if >100% sens AND TT < profile target)(YyY = YGY, 2)

- 642
- 643 1) **yGY** would be the combination of setting a milder % profile, yet orienting the loop to a lower
644 target. Usually we do not use this combination, but it would be OK for an instance where we
645 want to start the next meal at a low target, but we want our loop to be careful and not rush
646 getting there.
- 647 **YGy** would be the combination of setting a more aggressive % profile, yet orienting the loop to
648 a higher target. Usually we do not use this combination, but it would be OK if we believe we are
649 in a state of enhanced insulin need, and want to get to a set elevated TT (which could be what
650 we want to go max down to to have room for exercise, or just to be sure not to go into a
651 hypoglycemia if we misjudged the symptoms about enhanced insulin need.
- 652 2) GyG is the same as GGG, differing only *if* (e.g. an Automation) sets a *TT>profile target*. The
653 GyG setting *only then* provides softer loop response, due to the exercise mode kicking in.

Generally, a yellow middle button *y* works really only in the combination *..yy*. Any combination ending *yG* or *yY* will work the same as if it were ending *GG* or *GY*. Although the yellow middle button does not make a difference in these cases, it might be “justified” by the loop showing its readiness to employ the exercise mode, whenever a *TT* > profile target comes around, e.g. via an Automation.

3) *yyY* would essentially working like *yGY* (discussed under 1), because the middle button, whether *y* or *G*, makes no difference with an elevated *TT*.

Again, this the combination of setting a milder % profile, yet orienting the loop to a lower target. Usually we do not use this combination, but it would be OK for an instance where we want to start the next meal at a low target, but we want our loop to be careful and not rush getting there.

Yyy would be the combination of setting a more aggressive % profile, yet orienting the loop to a higher target. As opposed to the *YGy* case (discussed under 1), in *Yyy* the Exercise mode is active and strongly reduces aggressiveness. It is hard to imagine, why this combination this combination of settings could make sense; maybe if a “long waved” state of reduced insulin sensitivity meets a case where normally *Gyy* would be sought (see there).

5.3.3 Active Automations (or middleware in Trio, iAPS)

Active Automations can temporarily set different aggressiveness will automatically adjust to the color scheme discussed in the previous chapter.

It is important to be aware also, which of your Automations (see listed in your AUTO tab, or via the top left burger menu, in AAPS) is **active to eventually “kick in”**.

The ones where you clicked “User Action” should also show as an **extra grey button** on the bottom of your AAPS screen (only in the suitable time-of-day bracket, if you assigned one).

Note that an **Automation might not be permitted** to change settings if still **another Automation is running**. (Always consider that, **try to use short durations** in your Automations!).

For instance, you cannot switch from 130% profile to 110%. Either the 130% times out, or you **need an extra “in-between” Automation that terminates** the 130% under described conditions (example see in [Case study 6.2](#)).

This “design” is for a good reason: The assumption here is, that your 1st Automation (the 130% in the example) is designed well and runs for a reason. It should either “get finished” when the job might be done (and kick in again, if not), or, in exceptional cases, it should be consciously terminated by another well thought through 2nd Automation (describing the

conditions in which you would find that other Automation more important than “finishing up” the one that was already running). That “in-between” Automation makes the loop return to base profile, which is a signal *to all Automations*, to now check whether any conditions exist, to activate a 3rd Automation (as in example of [Case study 6.2](#)).

Advice: 1) Do some “house cleaning”: Occasionally check which of your Automations might work with shorter durations assigned. Reduce your long list of Automations, or at least de-activate those that will not be needed.

In case you have many Automations, you could make it an evening routine to activate only those Automations that you might need next day.

2) Try to stay away from Automations that also aim at temp. modifying aggressiveness (especially if triggered by bg level). Often, they will not kick in anyways. And generally, it is not a good idea, to “double up” sub-algorithms for tweaking loop behaviors (“loop inside a loop”).

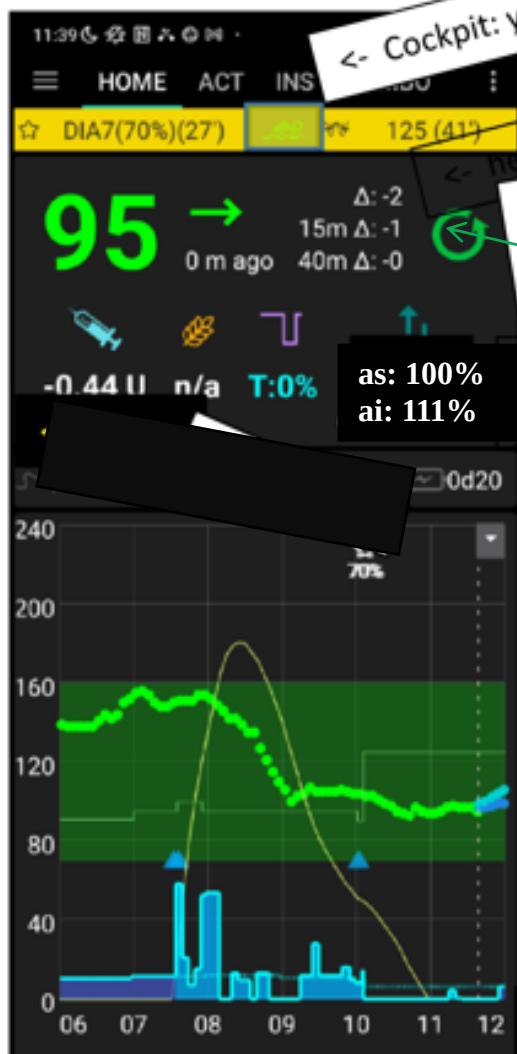
5.3.4 FCL related indicator fields in the AAPS home screen

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

- To recognize whether autoISF currently runs with **ISF adaptation** or not, please consult the **“ai: %” indicator** below the Autosens% **on the AAPS home screen**.
- Details for every loop decision see result/debug section of the **SMB tab**.
- The AAPS home screen additionally shows, above the deltas, the current **acceleration** Having a look at that can be valuable. For instance, when glucose is relatively low and still falling, a positive (and getting more positive) acceleration indicates that bg will swing back up, rather than crash low. This will give info about necessary snack size, and hence help avoid both, unnecessary calories, and going on a bg roller coaster.

5.3.5 Overall home screen: *(do a new picture)*

Overall home screen:



<- Cockpit: yellow fields=>temp. modulated sens.

<- more additionally: acceleration-factor

as: 100%
ai: 111%

<- Autosense status

<- Factor resulting from autoISF

<- buttons „bolus“ „carbs“ etc. eliminated

724

725

726

5.3.6 Info given every 5 minutes in the SMB tab

(If **tab** not shown -> Config.builder/APS: tick box on the right)

When clicking on the SMB tab, you see how your standard and temporary settings, as well as the latest bg and iob status, influenced the last decision of your FCL.

Example 1: A 80% temp. profile modulates 60% iobTH to 80% of 60% = 48%:



The profile ISF of 41 mg/dl/U got modified by the set 80% temp. profile to $41/0.8 = 51.3$ mg/dl/U, called “ISF unchanged” (before “start autoISF”).

autoISF applies the 4 sub-categories (acce, bg, pp and dura_ISF), and depending on the bg curve form suggests various ISF changes.

The final resulting factor “sens” (see flowcharts in [section 3](#)) is 1.11 (in our case, driven by bgAccel_ISF). This changes the 51.3 “unchanged” ISF to $51.3/1.11 = 42.4$ mg/dl/U

Further down in the SMB tab, you can see how this ISF is applied to define the SMB size to be given, and whether any limitations – notably by autoISFmax, max possible SMB size, or maxIOB – cut the amount.

```

COMBOV2  SMB  AUTO  NSI  ⋮
Last run : 3/30/24 22:18

Result

Script debug : d:
  Activity monitor disabled
  inactivity detection: sleeping
  hours
  Autosens ratio: 1;
  Basal unchanged: 0.48;
  ISF unchanged: 51.3
  CR: 10

-----
start autoISF 3.0.1
-----
User setting iobTH=60%
modulated to 48% or 4.8U
due to profile % and/or
exercise/activity mode
SMB enabled; current target
90 is even number
Loop allows maximum power
acce_ISF adaptation is 1.11
bg_ISF adaptation is 1
pp_ISF adaptation is 1.09
dura_ISF adaptation is 1.03
because ISF 51.3 did not do it
for 15 m
final ISF factor is 1.11

-----
end autoISF
-----
currenttemp: 0.34
lastTempAge: 0 m
tempModulus: 28 m
  
```

Message	Condition	What does it affect?
Loop allows maximum power	even target < 100	increase in bg limited to 30%, otherwise no SMB; actual SMB delivery ratio is max of fixed smb_delivery_ratio and linearly growing ratio
Loop allows medium power	even target >= 100	increase in bg limited to 20%, the AAPS default, otherwise no SMB; actual SMB delivery ratio is either fixed smb_delivery_ratio or linearly growing ratio
Loop allows minimal power	odd target	no SMB, only TBR available for action
Loop power level temporarily capped	IOB > effective iobTH	Last SMB capped to stay below iob threshold + 30% overrun; IOB getting above user defined iobTH, potentially modulated by exercise mode, activity monitor and profile percent
Loop allows AAPS power level	no even/odd target option active	SMB enabled/disabled according to standard AAPS rules and settings; no iobTH threshold is active

Note that in the SMB tab you can– in “real time” - capture and analyze *only one* decision.

753 5.3.7 Info about last 15 autoISF decisions

754
755 Refer to [section 11.2.2](#) for an option that enables extended analysis of the on-going ISF modul-
756 ations from autoISF. (To do this on your **Android** loop phone requires QPython and a logfile
757 emulator).

758
759 You get tables like this ...

17:05

760
761 ... which gives you a quick orientation about recent loop decisions, and relative contributions of the
762 various autoISF contributors (ace, pp, bg, dura).

763
764 A similar table is available also on the **iPhone** for Trio and iAPS users of their autoISF variants.

765
766 5.3.8 SMB tab info when operating in 1-minute mode with Libre3

767
768 *Users: Please supply text and screenshot*

769
770
771
772 5.3.9 Summary: Your personal FCL cockpit (for maneuvering through disturbances)

773
774 A lot of avenues were shown that could help you or your loop maneuver through a variety of
775 “disturbances”. You should not have to try out many of them, and (like the author), you should find
776 a way to narrow it down to what really helps in **your** everyday T1D management.

777
778 Try to **keep things as simple and clear as possible.**

779
780 Especially, do not pre-maturely rush into setting up Automations as quick over-patches for what
781 you may not like to see. Limit the number of Automations, and further limit which ones from your
782 list are every-day active (vs. switched off, and only ticked active for special days).

785 5.4 Modulating aggressiveness manually from the improved FCL-cockpit

786

787 *Skip this section 5.4 (next ~8 pages. Continue with section 6) unless you are deeper*
788 *interested in discussing further user interface upgrades. Actually, some suggestions made are*
789 *probably an “over-design”. After trying a lot of options for refinements out, the author returned*
790 *pretty much to a “keeping-it-simple” route.*

791

792 *My main suggestion is to get that violet loop button (sections 5.4.1-5.4.2), something I think many*
793 *would use - very handy certainly in the setting-up stage, too, for easy switching between the “old”*
794 *HCL, and new territory in FCL.*

795

796 autoISF is an early dev variant of AAPS, and as user you are participating in an on-going
797 development. Of note, autoISF 3.0.x was launched without many of the cockpit features that are
798 suggested below in green font color.

799

800 Only what is written in black is currently of some relevance for using autoISF.

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

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

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

808

809

810 Keep in mind, that the **goal should be to interfere with the loop as little as possible**. Under
811 certain conditions, it can run **fully automatically** without any user interaction, as described in the
812 preceding [section 4](#). + [section 5.1](#).

813

814 Just like in the airplane **cockpit**, also cruising in full auto mode should involve having an eye on
815 the instruments, and on potential disturbances ahead in the environment.

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

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

820

821

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

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

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

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

828 All this is facilitated within seconds right from the AAPS home screen's **cockpit features to the**
829 **extent they are already incorporated, or** to the extent you can build **alike** DIY cockpit features via
830 Automations, as described in [section 4.1.3](#) and [case studies 5.2](#) and [6.2](#)):

831

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

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

838

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

841 Taken together with some **new indicator fields** about your loop state ([section 5.3.3](#) and [5.3.4](#)),
842 and the **grey DIY cockpit buttons** ([section 5.2.2.3](#)) this makes the AAPS home screen your
843 **cockpit** for Full Closed Looping.

844

845 Let us look on each of these **suggested** cockpit elements in some detail:

846

847 5.4.1 Violet FCL icon and underlying buttons

848

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

852

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

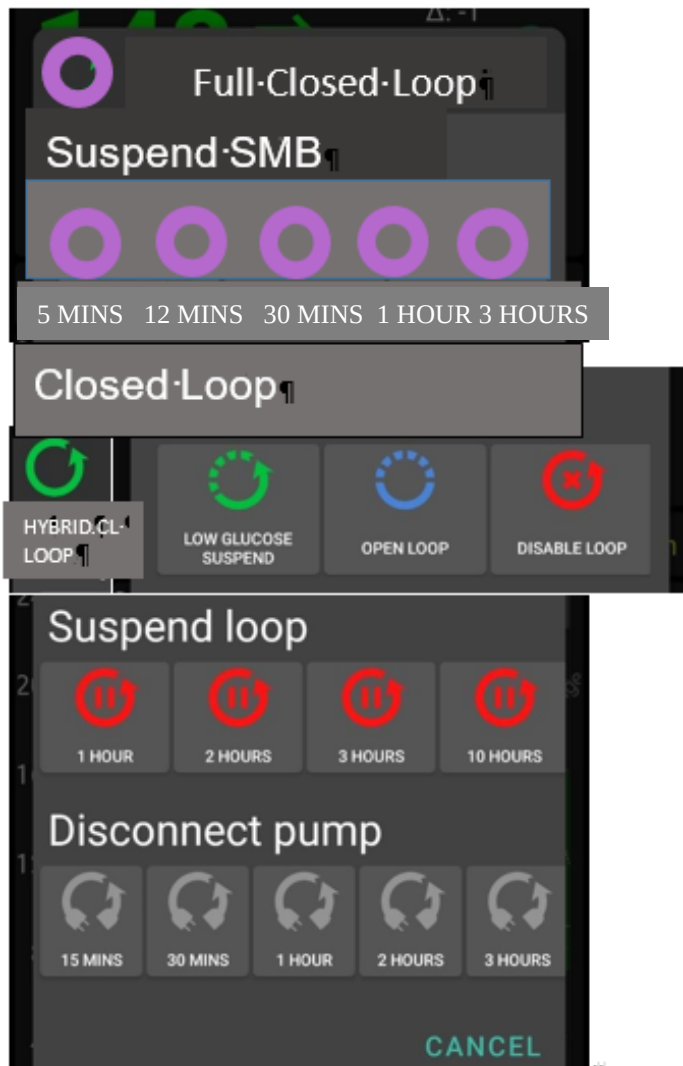
856

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

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

861

862 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.¶

Skip:

= This User Interface is a not implemented idea only.
Please contribute, or wait for update with the missing info

863

864 Pressing „**Suspend SMB**“ provides fast and easy „emergency braking“ regarding delivery of more
865 SMBs:

866 Select the one with the desired number of minutes: 5 or 12 for just blocking the potential next
867 SMB(s), and up to 3 hours to manage the entire rest of this meal with %TBR from then on.

868

869 Whenever, and why-ever, your FCL is in „no SMBs allowed“ mode (e.g. automatically after
870 surpassing an iobTH, or triggered by a set odd TT), the FCL icon will turn into a dotted one.

871 Instead of remaining **duration to end time** it indicates in the middle „the condition“, „**iob**“ or „**TT**“

872 Add an indication if suspend SMB comes from an Automation, e.g. add an „**(A)**“, **underneath** the
873 #minutes, iob, or TT in the middle of the dotted violet field.

874 So, as in other (already in HCL existing) cases, those icons show in the middle the minutes left that
875 they will be running, or the condition which would have to go away for this temp. setting to stop.

876 It always auto-reverts into the FCL state and FCL icon, when time (or other condition) has elapsed.

877

878 Pressing „**HYBRID CL. LOOP**“ or other buttons from the 2nd row provides fast and easy

879 „emergency **exit**“ into other modes.

880 This enables beginners an easy „temp. escape“ into their well-known HCL (green) at any
881 point of time. bgAccel_ISF_weight is set to zero when going FCL->HCL. HCL can run with
882 autoISF (for instance dura_ISF) uninhibited otherwise. (check implications for HCL users of
883 autoISF ??).

884 Note: These options from row 2 have no time limit. Loop will **not** by itself go back to FCL. You see
885 the different loop icon as a reminder to manually revert, when ready.

886

887

888 5.4.2 Buttons „Insulin“, „Calculator“ etc at bottom of AAPS home screen

889

890 These buttons are **not useful any longer in FCL**, and automatically disappear whenever in FCL
891 mode (also in Suspend SMB state), and re-appear when leaving FCL. This applies also when an
892 Automation or technical system failure shut off FCL.

893 Users who, maybe in the beginning phase, feel better having those buttons, can override
894 the removal (of the insulin button, or any other) by going into /preferences/overview/buttons
895 and forcing them on. They only remain on until the next re-entry into FCL mode, when auto-
896 off happens again.

897 The reason why we do this: It really is important to let the loop loop, and not interfere more
898 than absolutely needed. Any bolus the user gives will sure distort the bg curve, on which
899 autoISF, especially when aggressively tuned for FCL, builds a lot of its decisions!

900

901

902 5.4.3. Three top fields (%profile, exercise, TT)

903

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

906

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

911

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

915

916 Information printed on the top buttons

917

918 The yellow TT field shows the currently valid TT (and further duration):

919 (profile) stands for the abbreviation you labeled your selected running profile



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



...and ...

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



925

926 Likewise, if on the AAPS main screen just an **EatingSoonTT** is set (e.g.72), this is entered with the
927 desired duration. Afterwards, it automatically reverts to profile target and the display turns grey
928 again (can also turn green first, for a short transition period), with the profile target (e.g. 90) on it.
929 (No time limit, then, for the profile value as set in preferences).

930 Without sports context, the middle field remains grey.



932

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

936



938

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

942

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

947

948
 949 5.4.3.1 TT dialogue field (Currently not available in the pictured form and function !)
 950
 951 The TT field (top right of AAPS home screen) is a primary daily interface, and a dialogue field
 952 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 for AC and framed blue. (This is because the preceding AC mode is automatically determined in length by the loop observing when iobTH is exceeded)

Skip: = This User Interface is a not implemented idea only. Please contribute, or wait for update describing the eventual implementation

953
 954
 955 This looks complicated but only because it allows 4 different modes of use. Each user will primarily
 956 use her/his preferred one.
 957 (1) Who is happy with the initially well tuned FCL and does not have huge variations in daily eating
 958 and moving around, will **not use** the TT **at all**. FCL is possible without an intervention via the

959 TT button in your cockpit. Actually 4 of 8 modes (GGG ...YYY permutations, list see [section](#)
960 [5.4.1](#)) are not making use of TT.

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

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

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

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

968 Alternatively, iobTH can be temporarily changed in /preferences or using an Automation.
969

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

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

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

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

988

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

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

999

1000 Pressing exercise related buttons will automatically also light the **exercise button** on the main
 1001 screen yellow.

1002

1003 To summarize, the TT dialogue field offers easy but powerful ad-hoc [modulation of loop](#)
 1004 [aggressiveness](#) for FCL (if already included).

1005

1006

1007 [5.4.3.2 Exercise button](#) (see more in [section 6](#).)

1008

1009 The exercise button automatically lights yellow when exercise related TTs are activated [in the TT](#)
 1010 [dialogue box](#).

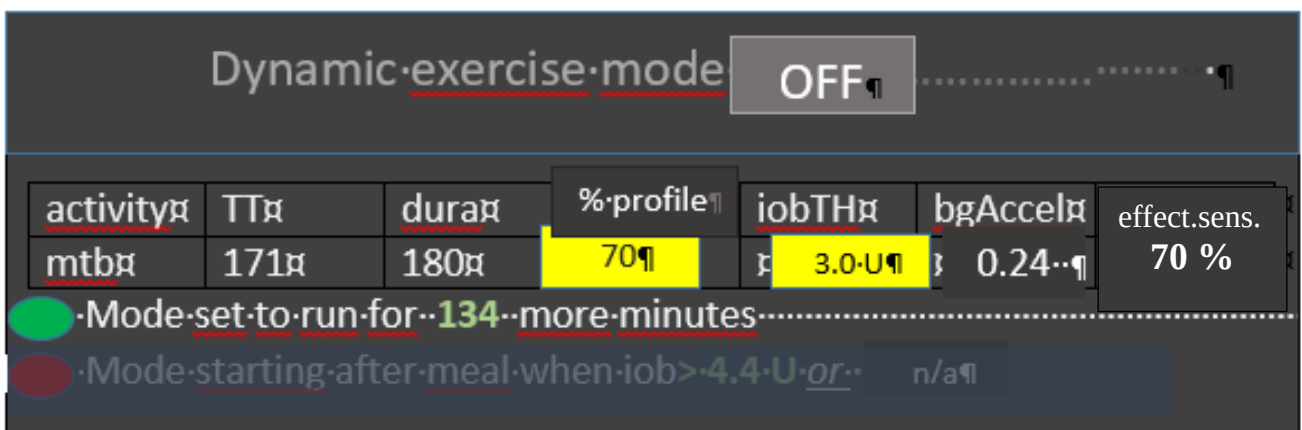
1011 4 of 8 principal FCL modes ([section 5.4.1](#)) are making use of the exercise button.

1012

1013 If pressing on the exercise button, a dialogue box appears (*if extended design for FCL cockpit is*
 1014 *already launched*) with info on exercise setting first (and opportunity to override), plus below the
 1015 activity monitor (experimental for auto-tracking of lighter movement during the day, and effects on
 1016 sensitivity that may have. See [section 4.5](#)).

1017

1018 So, first the exercise settings (as set under TT) are there to read. Example :



1019

1020

1021 The exercise (here mtb) is selected in the dialogue box of the neighboring TT field, and there auto-
1022 filled with settings made in the set-up and tuning stage by the user under preferences. They are
1023 reported also under the exercise button here, and TT, duration, and % sens (the temp. profile
1024 sensitivity that also shows on the %profile field on the left side of the exercise button) can be temp.
1025 changed there.

1026 iobTH, bgAccel_ISF and overall resulting effective sensitivity ratio (effect.sens. %) is given in the
1027 other fields.

1028 The **middle field** of the table, „% **profile**“ either picks up the % set under the %profile button, or
1029 an input can be made here, in the exercise button domain, which will:

- 1030 • turn the neighboring %profile button on yellow and show that inputted % on it, too
- 1031 • be multiplied with the result from the exercise mode settings per se, and change the %
1032 overall, accordingly.

1033 So, if this middle field of above table (dialogue box of sports button) contains a figure other than
1034 100, input field becomes yellow, and you are operating with a combination of traditional PLUS new
1035 exercise mode (with all three top buttons of your FCL cockpit yellow). This maximally will soften
1036 aggressiveness, for which you get an idea by the last calculated figure.

1037

1038 The mode is either running already (for another number of minutes, as probably also shown in the
1039 yellow TT field anyways). Or it is scheduled to run, after insulination for a started meal reaches
1040 iobTH (as in table). Or, no exercise is scheduled (both points red, no entries).

1041

1042 The lower part of the exercise dialogue box (not pictured above, but see in [section 6.5](#)) is
1043 dedicated to the Activity Monitor

1044

1045 5.4.3.3 Profile button

1046 The profile button can still be used to set a different profile, or profile%, for instance to adjust for
1047 days with sickness (as you are used to from hybrid closed looping). 4 of 8 modes are not making
1048 use of the profile button.

1049

1050 Any inputs made here will be used to modify profile_ISF on which all further changes are made on
1051 (multiplied with).

1052

1053 The profile field remains grey if standard profile is applied.

1054 It turns yellow, displaying a %figure relating to any altered loop overall aggressiveness:

- 1055 • When no inputs (changes from 100% profile) are made here, but inputs in the TT field,
1056 e.g. for exercise, automatically lead to different effective sensitivity ratio

1057 • when% is changed by input in the profile button itself, it will be multiplied with with
1058 profile_ISF and be used in place of profile_ISF *by the algorithm*.

1059 However, for exercise (sports) you no longer must make an entry here, because
1060 reasonable %reductions should be automatically provided, driven by your set TT (and half-basal
1061 exercise target), see [section 6](#).

1062

1063 5.4.4 FCL related indicator fields in the AAPS home screen

1064

1065 In extra data fields of the AAPS main screen you can always see (not change) the key
1066 „aggressiveness“ parameters your loop currently operates with (see also home screen
1067 example below):

1068 • how profile sensitivity (**ISF**) adjusts by the %profile input, by autoISF, and/or a set
1069 exerciseTT, resulting in an effective sensitivity (ISF that is used to determine
1070 insulinRequired. Details for every loop decision see result/debug section of the SMB tab).

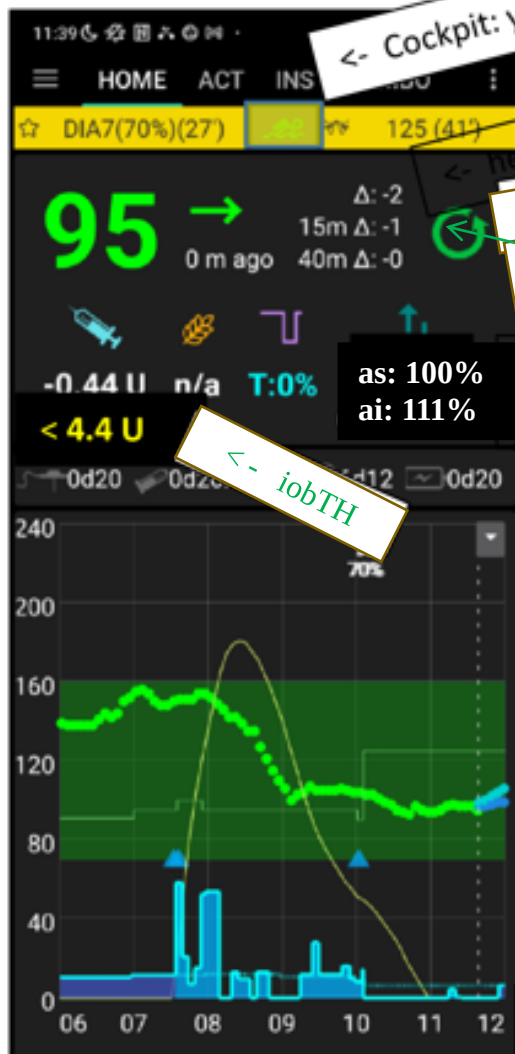
1071 • next to current available iob number is an indication of your **valid iobTH** (the iob above
1072 which no more SMBs will be given)

1073 • The AAPS home screen additionally shows, above the deltas, the current **acceleration**

1074 Having a look at that can be valueable. For instance, when glucose is relatively low and still
1075 falling, a positive (and getting more positive) acceleration indicates that bg will swing back
1076 up, rather than crash low. This will give info about necessary snack size, and hence help
1077 avoid both, unnecessary calories, and going on a bg roller coaster.

1078
1079 5.4.5 Overall home screen with discussed further features:
1080
1081

Overall home screen:



<- Cockpit: yellow fields=>temp. modulated sens.

here additionally: acceleration-factor

<- Violet <-> green circle for FCL <-> HCL dotted if SMB off
in the middle: minutes counting down if temp.set;
below: (A) if coming from an Automation that is running

as: 100%
ai: 111%
<- Autosense status
<- Factor resulting from autoISF

Note: iobTH is currently not shown here, but can
easy be found in SMB tab, see next page

<- buttons „bolus“ „carbs“ etc. eliminated
(auto- re-appearing when violet -> green loop)

1082
1083