

## 5. Modulation of autoISF aggressiveness.

V 4.0

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
- 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 Recognizing loop state from the AAPS home screen

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- 5.3.3 Info on the top 3 buttons (profile, exercise, TT)
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- 5.3.8 SMB tab info when operating 1-minute Libre
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### 5.4 Manual modulation via improved cockpit

- 5.4.1 Violet FCL icon and underlying buttons
- 5.4.2 Bottom buttons “insulin” etc.
- 5.4.3 Top three fields
  - 5.4.3.1 TT dialogue field
  - 5.4.3.2 Exercise button / dialogue field
  - 5.4.3.3 Profile dialogue field

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

Case study 5.2: Sweet snack.

Case study 5.3: Compression low

*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

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 (frequent cannula changes), recognize and manage (partial) occlusions
  - 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

3. temporary change iobTH\_percent

4. temporary change the set %profile

5. temporary set different bg target (especially in connection with exercise mode)t

All of these are also easy accessible via Automations in AAPS

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

Note that in Automations you can go beyond above mentioned 5 avenues, and also include e.g. setting a different bgAccel\_ISF\_weight; or you can come up with a nearly surgical definition as to from which iob on, and other criteria, some temporary modulation of aggressiveness shall happen.

## 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 (and potentially all the time, as in [case study 4.3](#))

### 5.1.1 All autoISF ISF adaptations 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 meals, 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 standardoref(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.

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.

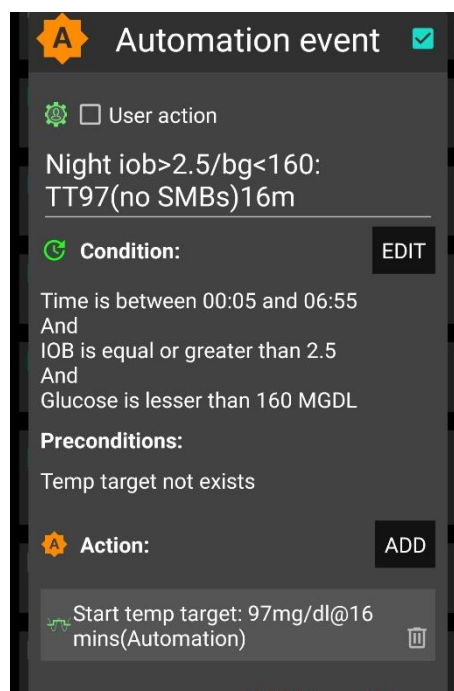
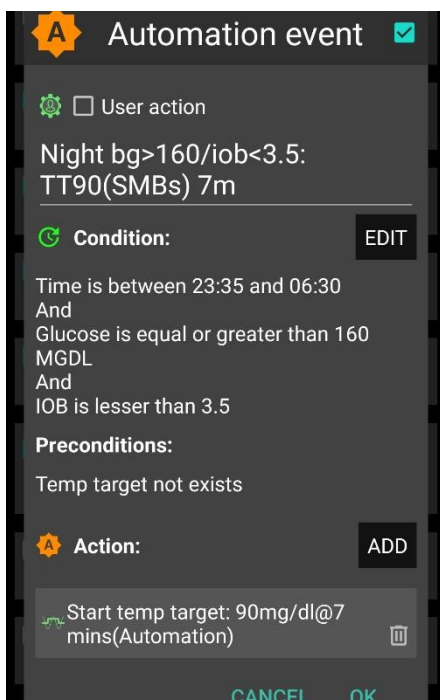
166 That is possible, with SMBs available (without them getting boosted via autoISF), and, for a  
167 long time, was the author’s favored solution for the nights.

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:

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

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

232

233 A variant of this mode is to define several windows in which autoISF aggressiveness  
234 (bgAccel\_ISF\_weight) and/or iobTH are automatically set differently

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

236 (*Breakfast at home, school lunches, school intermission snacks, dinners at home* could for  
237 example all deserve special settings regarding ISF\_weights and iobTH).

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

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

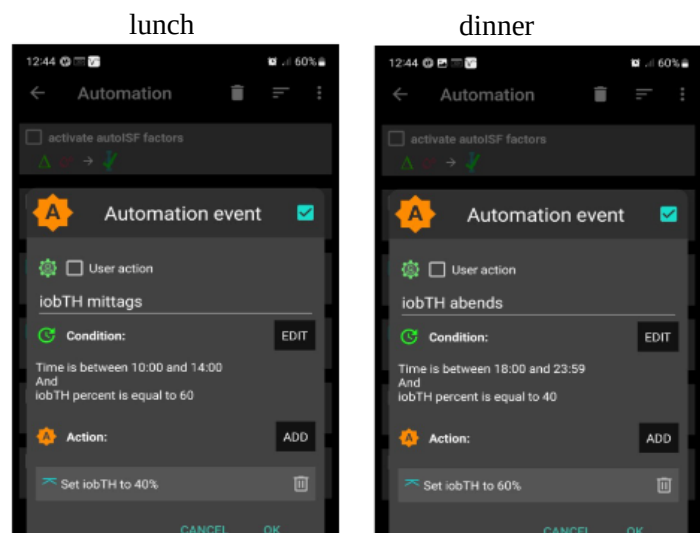
241 (*School lunches, or mother-in-law visits, would be examples*).

242 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.

243





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](#)

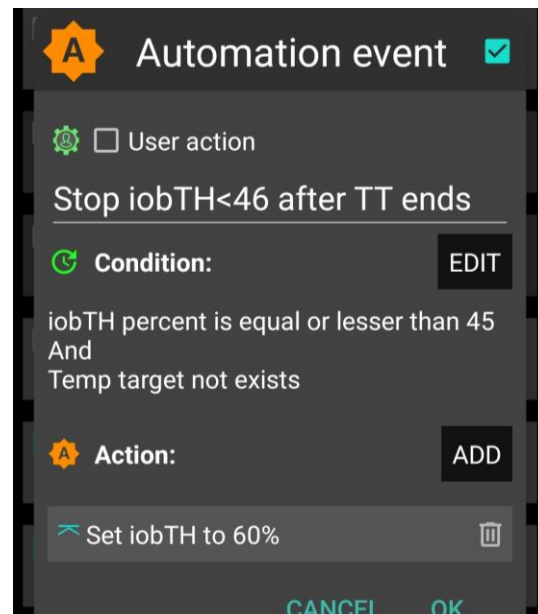
256

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 1<sup>st</sup> 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 in their everyday lives, this feature  
289 might fairly much close the gap towards being able to do a 24/7 hands-off FCL.

290

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

293

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

297

#### 298 [5.1.6 Pro/con completely hands-off Full Closed Loop](#)

299

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

303

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

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

309

310 Everybody must weigh for her/himself

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

314

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

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

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

321  
322 [Section 5.2](#) describes how you can use available “buttons” from your AAPS home screen to  
323 manually “nudge” aggressiveness of your FCL.

324  
325 [Section 5.3](#) will show how you recognize FCL state (aggressiveness) and understand recent loop  
326 decisions

327  
328 **No need to read section 5.4, unless you are interested in contributing to define/design/program**  
329 **further improvements). Ideas for an improved FCL cockpit in the future (probably an over-design; I**  
330 **intend to reduce to a few “really nice to-have” features)**

331 •

## 332 5.2 Modulating aggressiveness **manually**, from the DIY-FCL-Cockpit\*

333

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

336  
337 In [section 4](#), we dealt with major meals.

338  
339 In [section 5.1](#) we looked into ways to automate also a modified loop response to *foreseeable* situa-  
340 tions (tied to a time of day, geo-location etc), or to those *the loop could recognize* (with enough  
341 time to react).

342  
343 However: *Other disturbances* might come up, that:

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

350  
351 *In these scenarios*, you must find an easy way to

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

- 354 • 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 (like bgAccel\_ISF\_weight).

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.

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

#### 394 5.2.2.2 Making temporary changes in settings made in AAPS/preferences/Open APS SMB

395  
396 Going into AAPS/preferences/Open APS SMB allows to:

- 397 - set milder or stronger ...\_ISF\_weights
- 398 - set different iob\_threshold\_percent (or iobMAX)
- 399 - elevate or lower the SMB\_delivery\_ratio
- 400 - limit or expand max. allowed SMB size
- 401 - change the the even <-> odd logic for SMB on/off

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

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

#### 407 5.2.2.3 Triggered Automations: Grey extra DIY cockpit buttons for pre-programmed “responses”

408  
409 Recognizing conditions for fully automatic handling by the loop may not be not possible, or come  
410 too late for the loop to act on. Examples would be

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

418  
419 This not necessarily implies that snacks *need* different settings than a meal. After all, autoISF  
420 was designed to react to all available data, especially to where the developing glucose curve is  
421 headed. So, depending on your effort to set parameters for a broad variety of meals (notably:  
422 how well you avoid to invariably bounce fast against your iobTH), you might be able to accom-  
423 modate low carb, snack, and major meals with *one* set of settings.

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:

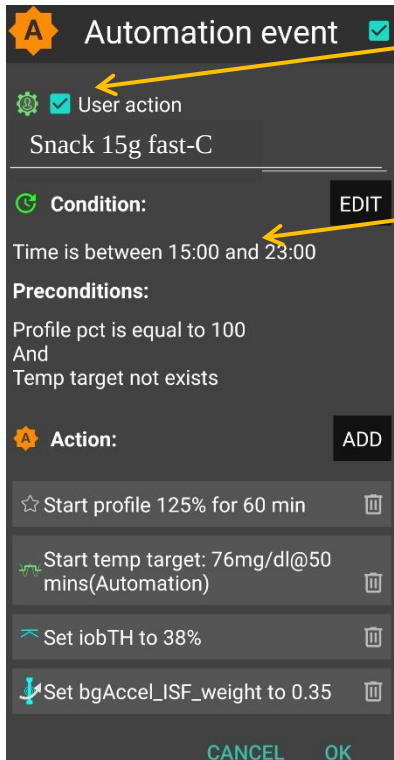
- that the safety limits as discussed in [section 2](#) will not block the intended elevated aggressiveness
- SMBs will not get outrageously big, and iobTH sometimes exceeded by too much.

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.

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



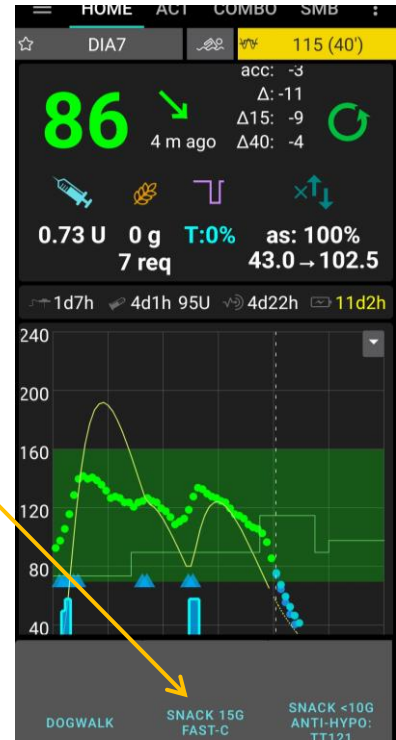
„User action“ is always ticked-on

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



465  
466  
467 So, this can be a little **extra “project” when setting up your FCL.**  
468 You need to research your snack habits (if any), and over time find out which settings in  
469 the snack-related Automations work well.  
470  
471 **In everyday life you then just must press the related button in your cockpit** (which is  
472 not time critical at all, except it should be clicked *latest* a couple of minutes after you took  
473 the drink or snack).  
474  
475 If you consume more, and also eat something with your sweet drink, this will more  
476 resemble a full meal... however, with unusual amounts of fast carbs.  
477  
478 **Caution:** Pressing your snack button a *second time* would **not** help because the lowered  
479 iobTH does not allow iob going high enough. So you are better off just letting your *normal*  
480 FCL meal routine run, after your snack mode expired.  
481

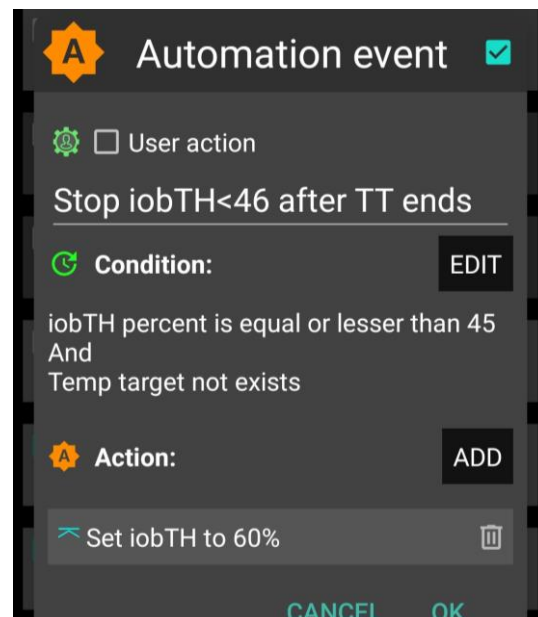
Question to developers: Do we already have, or can we get, the option to automatically block out using the same User Action Automation a second time within, say, 2 hours?

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 - - > )



### Installing the DIY cockpit button

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

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

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



## 520 Discussion

521

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

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

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

528

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

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

535

## 536 5.2.3 Temporarily exiting the FCL

537

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

540

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

543 (if in hybrid closed loop you like e.g. the dura\_ISF adaption still, you alternatively could elect  
544 to just set bgAccel\_ISF\_weight temp. to zero, instead)

545

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

547

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

551

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

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

555 (or, alternatively, set bgAccel\_ISF\_weight to zero).

556

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

560

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

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

567

568 To recognize whether autoISF currently runs with **ISF adaptation** or not, please consult the  
569 **“ai: %” indicator** below the Autosens% **on the AAPS home screen.**

570

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

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

574 • a set temporary target

575 • the Activity Monitor

576 • +/- exercise mode

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

579

## 580 5.3 Recognizing your loop state in the AAPS home screen

581

### 582 5.3.1 Modulated loop aggressiveness via the 3 top buttons in the AAPS home screen

583

584 3 Buttons (%profile; exercise; TT) allow temporary modulation of aggressiveness (sensitivity) as  
585 may be needed e.g.

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

588 ,

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

- 590 • Note that features like autoISF might still build on profile (regardless whether original, or a  
591 temp. modulated profile) for further modifications (See calculation cascade for used  
592 sensitivity (sens) in the SMB tab. Example see FCL e-book [section](#) ).

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

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

596

	<b>Less aggressive</b> loop = more sensitive user needs temp. less insulin	Standard loop using the set profile	<b>More aggressive</b> loop = less sensitive user needs temp. more insulin
% profile	under 100 % (y)	= 100% (G)	above 100% (Y)
Exercise button	ON (y) Note that it can	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)

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

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

602

603

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

3 Buttons (%profile; exercise; TT), each in 2 states, yellow (for modified), else: grey (G)  
 Note that yellow could be less (y) or more (Y) aggressive than standard profile  
 GGG is the loop running with set profile. Any yellow setting modulates sensitivity  
 or attempts to modulate, whenever another required condition may become true (e.g. also via an  
 Automation).

Overall, 2 exp 3 = **eight principal FCL modes** are possible. They need to be **differentiated further**, based on whether the modulation...:

- ...goes into the **more aggressive (Y, higher % and/or lower TT)**, or...
  - ...the *less aggressive (y, lower % and/or higher TT and evtl exercise)* direction.
  - Note the Exercise button works only one way, to make the loop less aggressive.
- DEV idea: Should we make the Y to violet or orange (more aggressive) and keep the y yellow (less aggressive 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)
yGy-yGY- YGy-YGY	„traditional“ exercise mode (if <100% sens AND TT > profile target)	<b>mixed cases 1)</b>	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)
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	<b>mixed cases 3)</b> yyY = yGY, 2)	Boosted EatingSoonTT (if >100% sens AND TT < profile target)( YyY = YGY, 2)

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

625 **YGy** would be the combination of setting a more aggressive % profile, yet orienting the loop to  
626 a higher target. Usually we do not use this combination, but it would be OK if we believe we are  
627 in a state of enhanced insulin need, and want to get to a set elevated TT (which could be what  
628 we want to go max down to to have room for exercise, or just to be sure not to go into a  
629 hypoglycemia if we misjudged the symptoms about enhanced insulin need.

630

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

636 Same as **GGG**, only *if* (e.g. an Automation) sets a  $TT > \text{profile target}$ , automatically a softer  
637 response due to additional exercise mode kicking in *then*.

638

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

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

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

650

651

### 652 5.3.3 Active Automations (or middleware in Trio, iAPS)

653

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

656 The ones where you clicked “User Action” should also show as an extra grey button on the bottom  
657 of your AAPS screen.

658

659 Note that an **Automation might not be permitted** to change settings by “**killing**” another still  
660 **running Automation** (always consider that, when putting the duration into your Automations!). For  
661 instance, you cannot switch from 130% profile to 110%. Either the 130% times out, or you **need an**  
662 **extra “in-between” Automation that terminates** the 130% under described conditions (example  
663 see in [Case study 6.2](#)).

664 This “design” is for a good reason: The assumption here is, that your 1<sup>st</sup> Automation (the  
665 130% in the example) is designed well and runs for a reason. It should either “get finished”  
666 when the job might be done (and kick in again, if not), or, in exceptional cases, it should be  
667 consciously terminated by another well thought through 2<sup>nd</sup> Automation (describing the  
668 conditions in which you would find that other Automation more important than “finishing up”  
669 the one that was already running). That “in-between” Automation makes the loop return to  
670 base profile, which is a signal *to all Automations*, to now check whether any conditions  
671 exist, to activate a 3<sup>rd</sup> Automation (as in example of [Case study 6.2](#)).

672

673 Advice: Try to stay away from Automations that also aim at temp. modifying aggressiveness (e.g.  
674 temp. setting different bgAccel\_ISF\_weight). For the reason just given in above note, they often will  
675 not kick in anyways.

676 Generally, it also is no good idea to double up sub-algorithms for tweaking loop behaviors (“loop  
677 inside a loop”).

678

#### 679 5.3.4 FCL related indicator fields in the AAPS home screen

680

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

684 • To recognize whether autoISF currently runs with **ISF adaptation** or not, please consult the  
685 “**ai: %**” **indicator** below the Autosens% **on the AAPS home screen**.

686 • Details for every loop decision see result/debug section of the **SMB tab**.

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

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

692  
693  
694  
695

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

Overall home screen:



<- Cockpit: yellow fields=>temp. modulated sens.  
here additionally: acceleration-factor

<- Autosense status  
<- Factor resulting from autoISF

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

696  
697  
698



### 699 5.3.6 Info given every 5 minutes in the SMB tab

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

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

704 Example 1: A 80% temp. profile modulates  
705 60% iobTH to 80% of 60% = 48%:



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

714 autoISF applies the 4 sub-categories (acce, bg,  
715 pp and dura\_ISF), and depending on the bg  
716 curve form suggests various ISF changes.

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

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

724

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

```

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
  
```

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

725 5.3.7 Info about last 15 autoISF decisions

726  
727 Refer to [section 11.2.2](#) for an option that enables extended analysis of the on-going ISF modul-  
728 ations from autoISF. (To do this on your **Android** loop phone requires QPython and a logfile  
729 emulator).

730  
731 You get tables like this ...

17:05

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

734  
735  
736 A similar table is available also on the **iPhone** for Trio and iAPS users of their autoISF variants.

737  
738 5.3.8 SMB tab info when operating in 1-minute mode with Libre3

739  
740 *Users: Please supply text and screenshot*

741  
742  
743  
744 5.3.9 Summary: Your personal FCL cockpit (for maneuvering through disturbances)

745  
746 A lot of avenues were shown that could help you or your loop maneuver through a variety of  
747 “disturbances”. You should not have to try out many of them, and (like the author), you should find  
748 a way to narrow it down to what really helps in **your** everyday T1D management.

749  
750 Try to **keep things as simple and clear as possible.**

751  
752 Especially, do not pre-maturely rush into setting up Automations as quick over-patches for what  
753 you may not like to see. Limit the number of Automations, and further limit which ones from your  
754 list are every-day active (vs. switched off, and only ticked active for special days).

755  
756

## 5.4 Modulating aggressiveness manually from the improved FCL-cockpit

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

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

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

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

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

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

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

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

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

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

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

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

- call up a pre-programmed routine for automatic management, with auto-adjusted aggressiveness, or:
- tweak a setting or two, to temporarily adjust the aggressiveness

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

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

803

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

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

810

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

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

816

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

818

#### 819 5.4.1 Violet FCL icon and underlying buttons

820

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

824

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

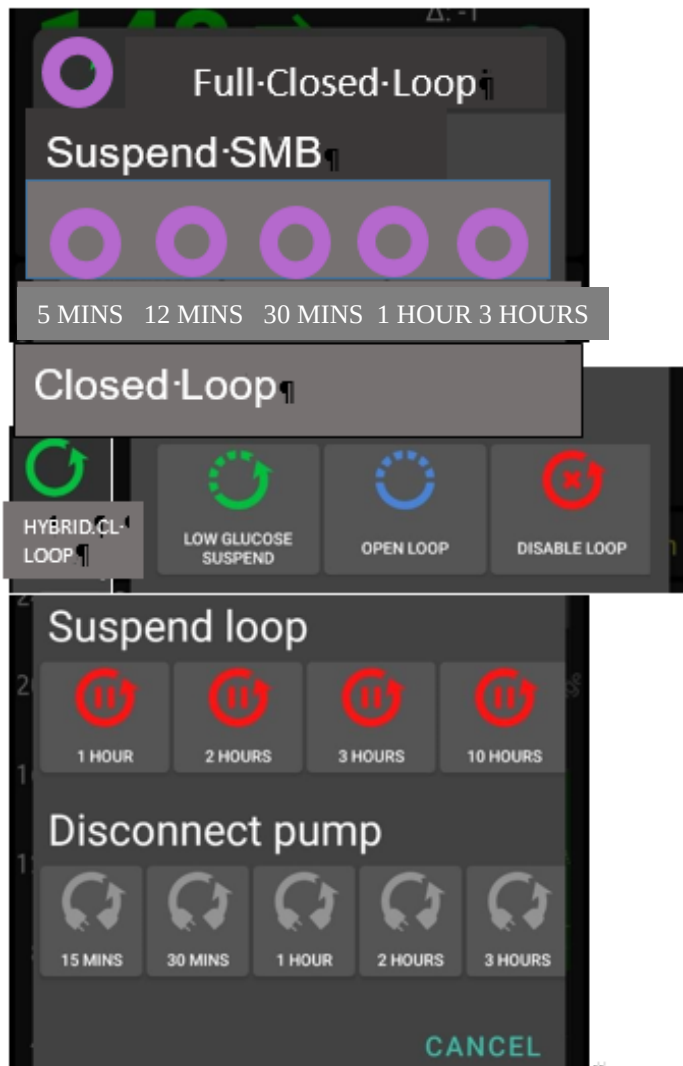
828

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

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

833

834 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

835

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

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

840

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

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

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

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

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

849

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

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

852 This enables beginners an easy „temp. escape“ into their well-known HCL (green) at any  
853 point of time. bgAccel\_ISF\_weight is set to zero when going FCL->HCL. HCL can run with  
854 autoISF (for instance dura\_ISF) uninhibited otherwise. (check implications for HCL users of  
855 autoISF ?? ).

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

858

859

860 5.4.2 Buttons „Insulin“, „Calculator“ etc at bottom of AAPS home screen

861

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

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

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

872

873

874 5.4.3. Three top fields (%profile, exercise, TT)

875

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

878

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

883

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

887

888 Information printed on the top buttons

889



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

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



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



...and ...

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



897

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

902 Without sports context, the middle field remains grey.



904

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

908



910



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

914

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

919

920  
 921 5.4.3.1 TT dialogue field ( Currently not available in the pictured form and function ! )  
 922  
 923 The TT field (top right of AAPS home screen) is a primary daily interface, and a dialogue field  
 924 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

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

**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)

925  
 926  
 927 This looks complicated but only because it allows 4 different modes of use. Each user will primarily  
 928 use her/his preferred one.  
 929 (1) Who is happy with the initially well tuned FCL and does not have huge variations in daily eating  
 930 and moving around, will **not use** the TT **at all**. FCL is possible without an intervention via the

931 TT button in your cockpit. Actually 4 of 8 modes (GGG ...YYY permutations, list see [section](#)  
932 [5.4.1](#)) are not making use of TT.

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

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

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

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

940 Alternatively, iobTH can be temporarily changed in /preferences or using an Automation.  
941

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

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

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

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

960

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

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

971  
972 Pressing exercise related buttons will automatically also light the **exercise button** on the main  
973 screen yellow.

974  
975 To summarize, the TT dialogue field offers easy but powerful ad-hoc [modulation of loop](#)  
976 [aggressiveness](#) for FCL (if already included).

977

978

979 5.4.3.2 Exercise button (see more in [section 6](#).)

980

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

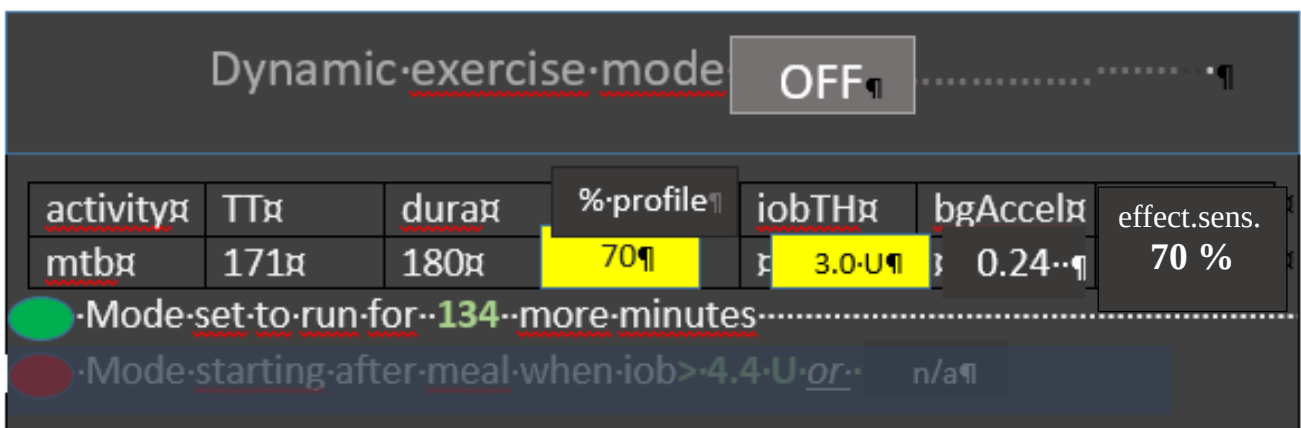
983 4 of 8 principal FCL modes ([section 5.4.1](#)) are making use of the exercise button.

984

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

989

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



991

992

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

998 iobTH, bgAccel\_ISF and overall resulting effective sensitivity ratio (effect.sens. %) is given in the  
999 other fields.

1000 The **middle field** of the table, „% **profile**“ either picks up the % set under the %profile button, or  
1001 an input can be made here, in the exercise button domain, which will:

- 1002 • turn the neighboring %profile button on yellow and show that inputted % on it, too
- 1003 • be multiplied with the result from the exercise mode settings per se, and change the %  
1004 overall, accordingly.

1005 So, if this middle field of above table (dialogue box of sports button) contains a figure other than  
1006 100, input field becomes yellow, and you are operating with a combination of traditional PLUS new  
1007 exercise mode (with all three top buttons of your FCL cockpit yellow). This maximally will soften  
1008 aggressiveness, for which you get an idea by the last calculated figure.

1009

1010 The mode is either running already (for another number of minutes, as probably also shown in the  
1011 yellow TT field anyways). Or it is scheduled to run, after insulination for a started meal reaches  
1012 iobTH (as in table). Or, no exercise is scheduled (both points red, no entries).

1013

1014 The lower part of the exercise dialogue box (not pictured above, but see in [section 6.5](#)) is  
1015 dedicated to the Activity Monitor

1016

#### 1017 5.4.3.3 Profile button

1018 The profile button can still be used to set a different profile, or profile%, for instance to adjust for  
1019 days with sickness (as you are used to from hybrid closed looping). 4 of 8 modes are not making  
1020 use of the profile button.

1021

1022 Any inputs made here will be used to modify profile\_ISF on which all further changes are made on  
1023 (multiplied with).

1024

1025 The profile field remains grey if standard profile is applied.

1026 It turns yellow, displaying a %figure relating to any altered loop overall aggressiveness:

- 1027 • When no inputs (changes from 100% profile) are made here, but inputs in the TT field,  
1028 e.g. for exercise, automatically lead to different effective sensitivity ratio

1029       • when% is changed by input in the profile button itself, it will be multiplied with with  
1030       profile\_ISF and be used in place of profile\_ISF *by the algorithm*.

1031 However, for exercise (sports) you no longer must make an entry here, because  
1032 reasonable %reductions should be automatically provided, driven by your set TT (and half-basal  
1033 exercise target), see [section 6](#).

1034

#### 1035 5.4.4 FCL related indicator fields in the AAPS home screen

1036

1037 In extra data fields of the AAPS main screen you can always see (not change) the key  
1038 „aggressiveness“ parameters your loop currently operates with (see also home screen  
1039 example below):

1040       • how profile sensitivity (**ISF**) adjusts by the %profile input, by autoISF, and/or a set  
1041       exerciseTT, resulting in an effective sensitivity (ISF that is used to determine  
1042       insulinRequired. Details for every loop decision see result/debug section of the SMB tab).

1043       • next to current available iob number is an indication of your **valid iobTH** (the iob above  
1044       which no more SMBs will be given)

1045       • The AAPS home screen additionally shows, above the deltas, the current **acceleration**

1046       Having a look at that can be valueable. For instance, when glucose is relatively low and still  
1047       falling, a positive (and getting more positive) acceleration indicates that bg will swing back  
1048       up, rather than crash low. This will give info about necessary snack size, and hence help  
1049       avoid both, unnecessary calories, and going on a bg roller coaster.

1051 5.4.5 Overall home screen with discussed further features:

1052

1053

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

re 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

<- Autosense status

Factor resulting from autoISF

ioBTH

Note: **jobTH** 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  $\rightarrow$  green loop)

1054

1055