

DISCUSSION CONCLUDING AAS 11-666

Ken Seidelmann noted that there will still be a requirement for predicted UT1 for space missions, where UT1 must be uploaded onboard spacecraft in advance. Dennis McCarthy replied that those sorts of things will probably still be there, but McCarthy thought that the process could be streamlined so that a good percentage of the user community could take advantage of the accuracy available in real time. McCarthy said the problem with predictions is that they degrade with time and will always degrade with time, and that predictions on the order of a week to a month will “do as well as you can predict the weather.” Seidelmann said that some spacecraft missions do not maintain continuous communication but contact may be available daily. McCarthy said that this issue exists for systems where there are concerns that space communications might be disrupted for an extended period. Rob Seaman said communication lapses are also an issue for ground-based systems, because modern telescopes tend to operate untended in remote locations. Arnold Rots asked if this is only an issue for Earth-looking spacecraft, rather than sky-looking spacecraft. Seidelmann replied that most Earth-orbiting spacecraft have ground access only periodically and operational spacecraft may need reasonably accurate knowledge of UT1 for antenna pointing far in advance to maintain space-based communications. Mark Storz added that if field of view is narrowly constrained then a sufficiently accurate prediction of UT1 may be required in advance.

Seaman said that he was able to follow McCarthy’s presentation until the mention of software where “you waved your hands and said that software will just naturally take this into account.” Seaman said that it is people like himself, Allen, Rots, and others within the community of astronomical software-development that will have to create this software. Seaman said he was also lost at the comment “You don’t care if people sell these time signals.” The missing link when it gets to the IERS appeared to be the network time protocol (NTP) which connects all these computers and keeps clocks running accurately until they disconnect from the Internet. Seaman said that the math seemed correct but the infrastructure needed to be closed; the people that need to be involved in that discussion would be NTP folks who wouldn’t necessarily accept responsibility for transmitting UTC and UT1 *both*. McCarthy thought “they would build it;” Seaman agreed that it will be built but only if someone is told they must build it. McCarthy said it was an opportunity to get people to use the “full-blown accuracy” of UT1-UTC. Allen quipped that perhaps he and Seaman could go into business selling an NTP service hacked to provide UT1.

Seidelmann noted that UT1 distribution is an issue independent of leap seconds. However, Terrett offered that if leap seconds were dropped, then more people would need this type of service, so the matter may not be independent. Seidelmann added that the redefinition of UTC forces everyone to accommodate a higher level of accuracy (perhaps whether it is needed or not). Terrett said now is the perfect opportunity to attempt some kind of service, while some attention is being paid to the issue. Seaman said if UTC is redefined, something like this *certainly* must happen.

George Kaplan asked if UT1-UTC is broadcast as part of the GPS navigation messages; McCarthy replied “No, not now.” Kaplan asked if there was a space for it. McCarthy said that there is a prediction formula for UT1-UTC in the navigation message now. Malys clarified that

this prediction is put into the so-called *five-line elements* used in the daily processing of the GPS ground control segment but it is not put into the broadcast messages. McCarthy concurred. Malys added that he would address ground operations in his presentation. McCarthy said that, per his understanding, GPS III is expected to have UT1-UTC as a broadcast element. Allen asked if its value would be constrained; McCarthy thought that the absolute value might be constrained to 99 seconds. Storz said his recollection of the ICD was that it would be limited to 64 (2^6) seconds. McCarthy added that he knew it was a double-digit value. Storz said the magnitude of that value would likely get us into the next century if UTC is redefined.