Status of Delta-DOR-related activities in JAXA

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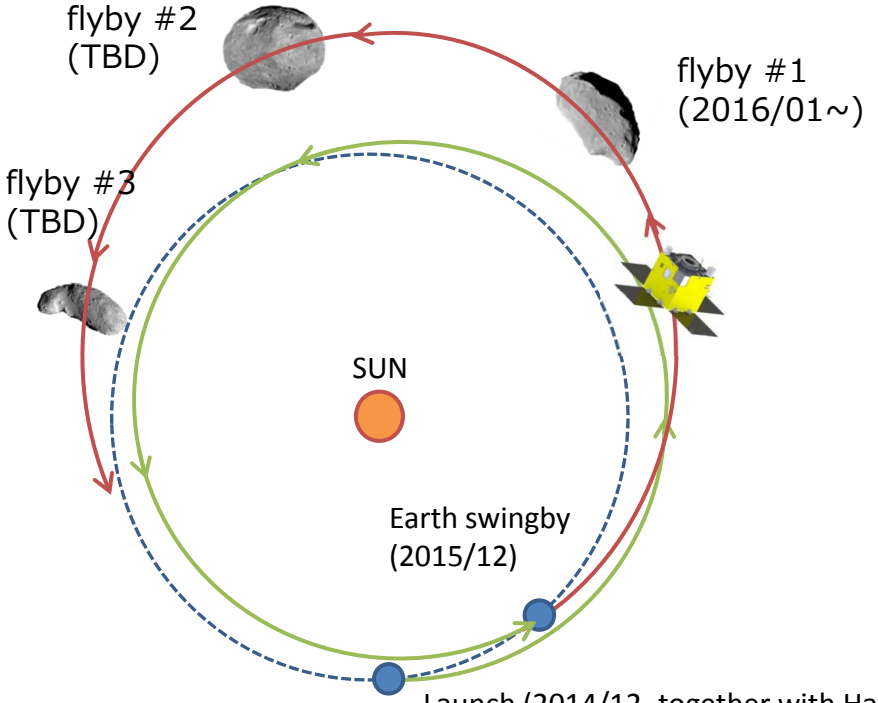
Recent activities in JAXA

- Development of DDOR correlator has continued. Now it has a capability to semi-automatically process RDEF files and generate TDM files.
- 10GbE direct output from data acquisition system is now under designing. Inter-agency data delivery test should be beneficial for planning of future cross-support activities.
- Delta-DOR cross-support for JPL InSight mission is now under negotiation.
- Delta-DOR cross-support testing with ESA should be planned for future cross-support for BepiColombo.
- JAXA proposes PROCYON mission in which sweeping DOR tones will be used to reduce phase-ripple error. JAXA requests to join the experiment to JPL and ESA for new technology developing purpose.

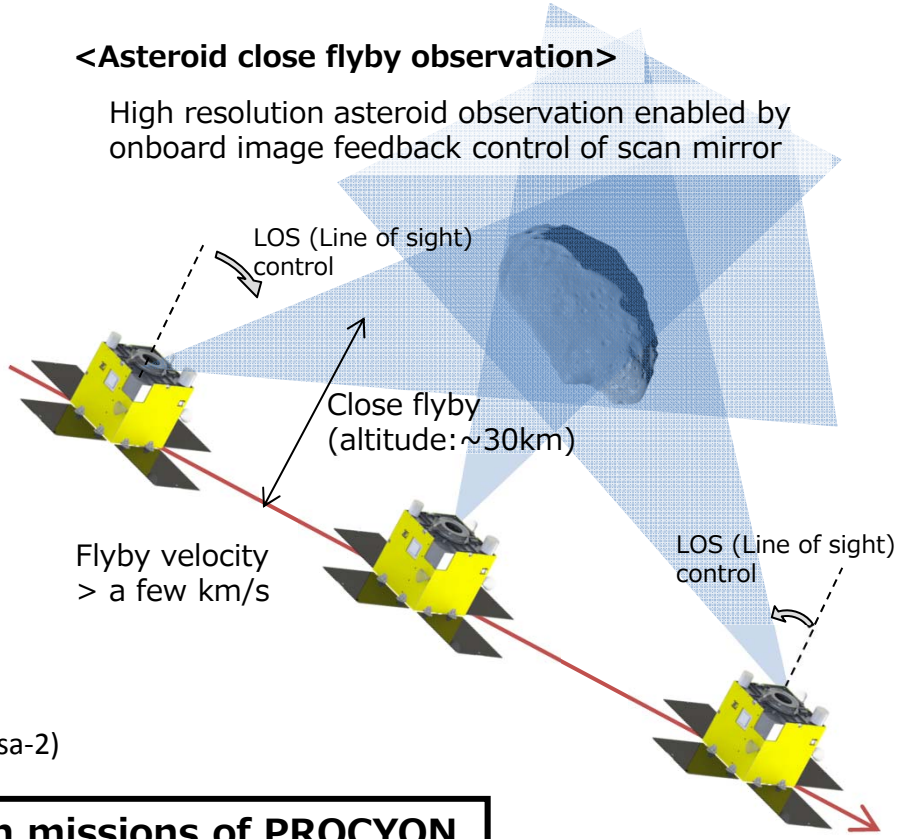
Mission of small deep space probe "PROCYON"

(PROCYON: PRoximate Object Close flYby with Optical Navigation)



<Asteroid close flyby observation>

High resolution asteroid observation enabled by onboard image feedback control of scan mirror



Technology demonstration missions of PROCYON

1. demonstration of 50kg deep space exploration bus sytem

(nominal mission)

a. power generation, thermal control, attitude control, communication, orbit determination in deep space

b. orbit control by small electric propulsion system

2. demonstration of other deep space exploration technology

(Advanced missions)

c. communication using high-efficiency GaN X-band power amplifier

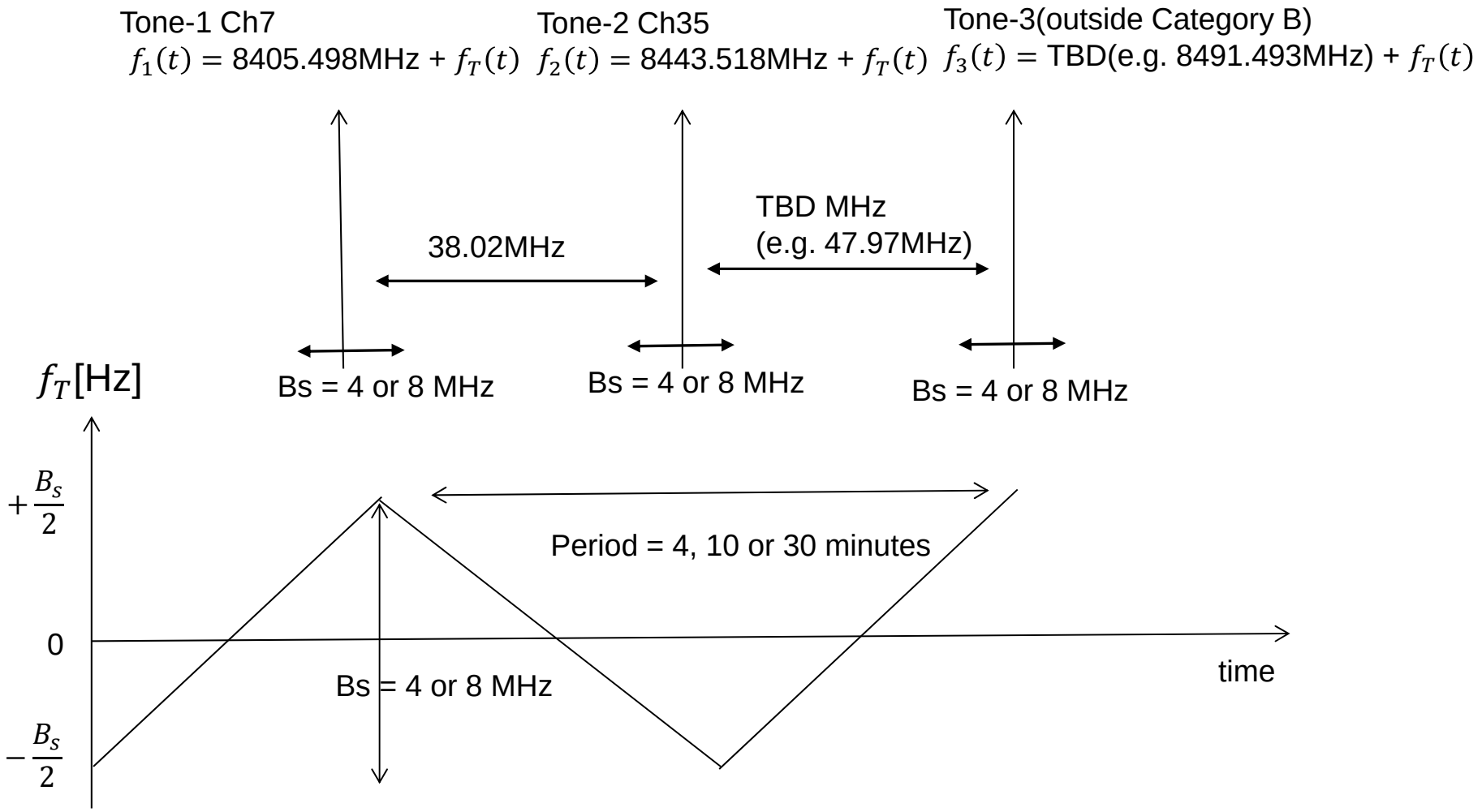
d. Precise DDOR navigation in deep space

e. optical navigation to encounter asteroid

f. asteroid close flyby observation

Sweeping DOR tones for PROCYON

Three independent tones are generated separately without phase modulation.
Three tones are slowly sweeped within the frequency band of Bs coincidently.



Requirement for sweeping tone recording

- Option 1: Recording whole bandwidth just like a Quasar scan
  Pros: Easy to configure the recorder
  Cons: Band characteristics of digital band-pass filter is not flat at band-edges.
  -> e.g. 3.8MHz or 7.6MHz of narrower sweep bandwidth may be better.

- Option 2: Tracking sweeping tones with narrow bandwidth just like a normal S/C scan
  Pros: Easy to process the data.
  Cons: Complicated setting needed for data recording.
  There may be limitation to track high-rate sweeping tones.
  (To be confirmed: Maximum tracking rate, phase glitch etc.)
  -> NASA system(up to 100kHz/sec), ESA system?
  No advantage if there are phase-ripples inside the pass-band
  (4 or 8 MHz) of digital baseband converter for quasar recording channels.