Theory Questions

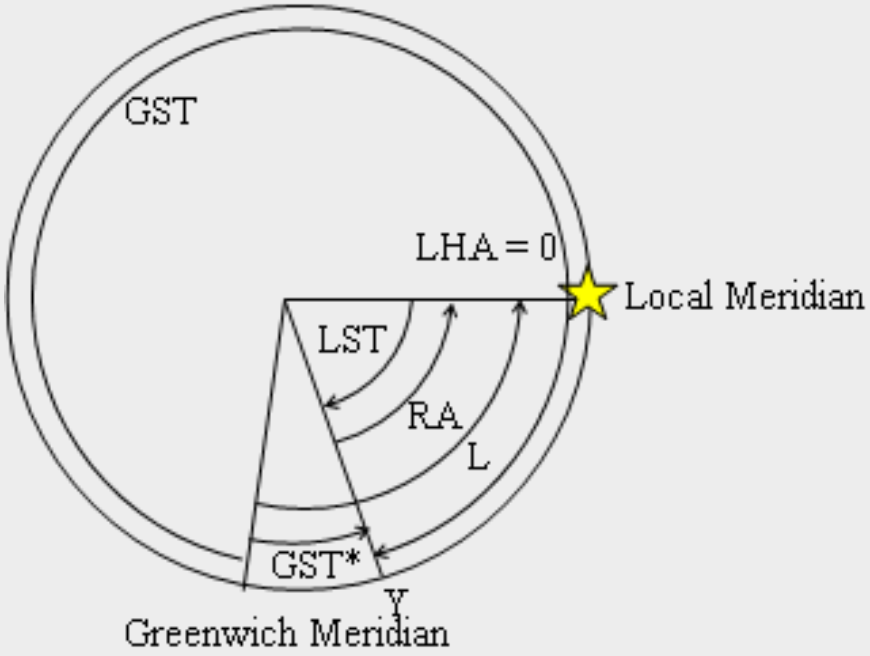
Short Questions : T1

Q1. The Large Magellanic Cloud (LMC) has R.A. 5h 24min and Dec –70°. GST at 00h 1st January is about 6h 36min. Latitude and longitude of Phuket are 7°53′ N and 98°24′ E.

The Small and Large Magellanic Clouds visible over the Paranal Observatory in Chile. Credit: ESO/J. Colosimo

Short Questions : T1

Objective: Find date when the LMC culminates in Phuket at 9pm.



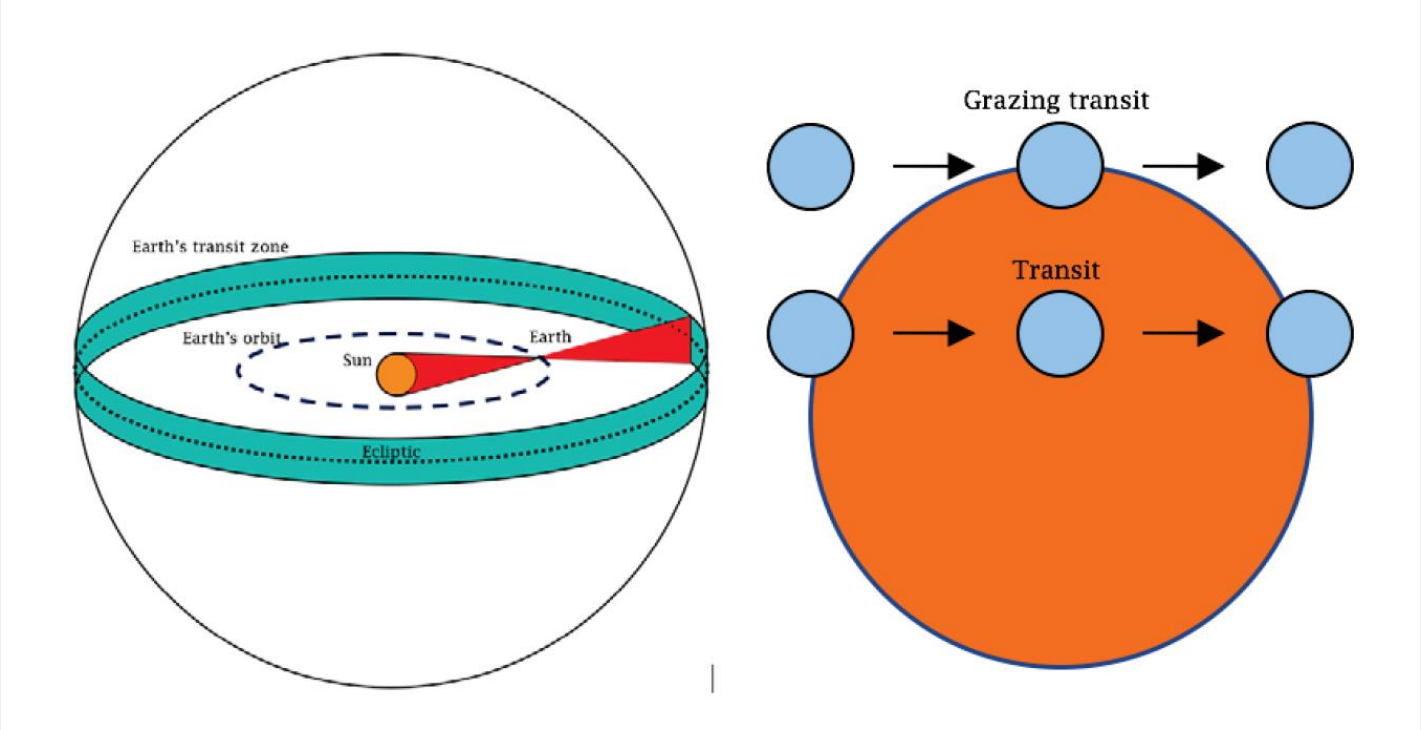
32.31 days
from 1st Jan

2th February.

Short Questions : T2

Q2. Earth's transit zone

How do extrasolar observers see our earth's transit?



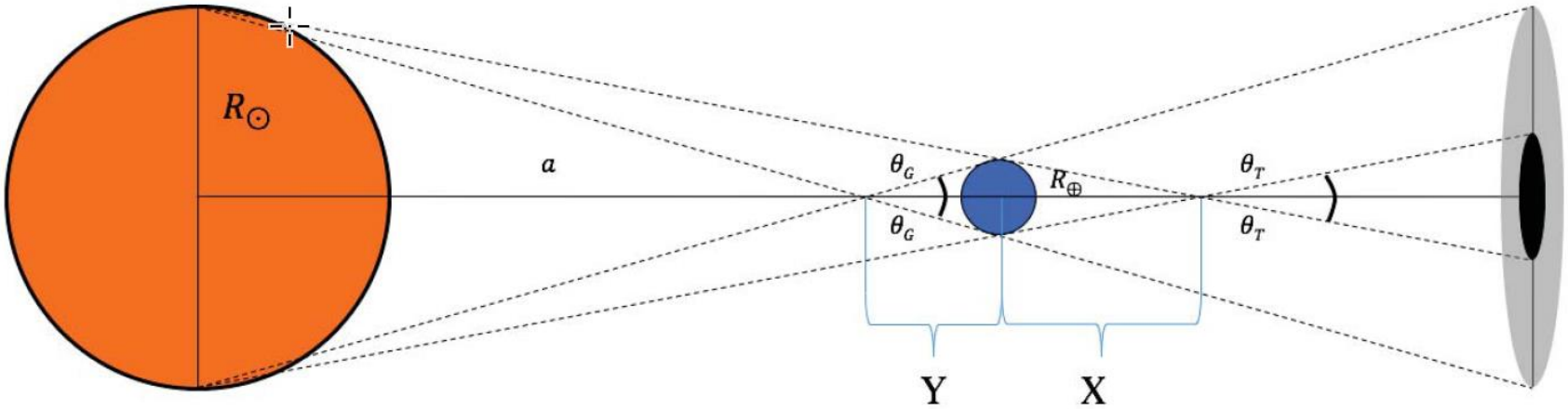
Short Questions : T2

Objective: Find the angular width of the earth's transit zone

a) when the whole earth's disc passing in front of the Sun.
b) when it is a grazing transit.

Short Questions : T2

Solution



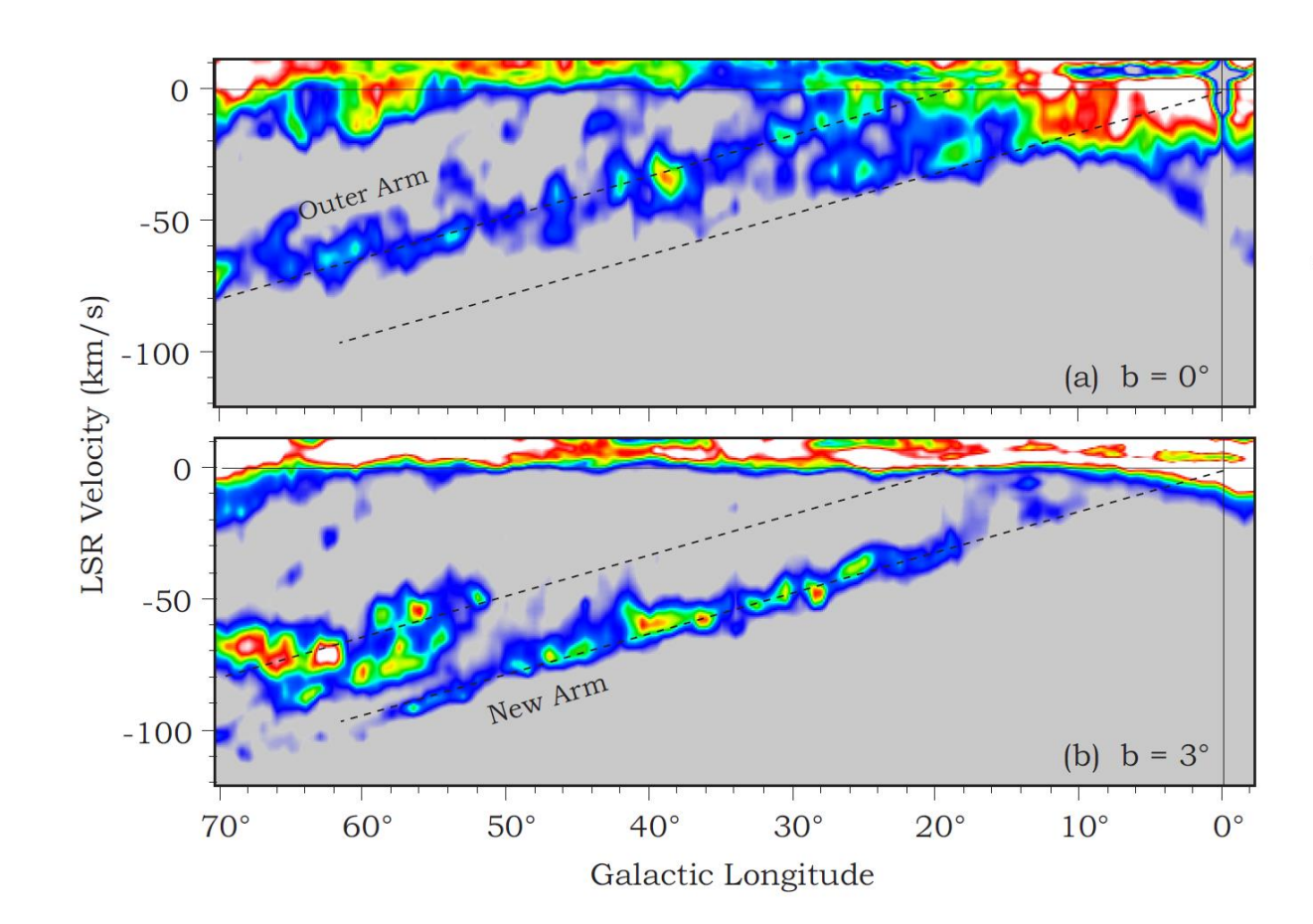
Short Questions : T3

T3. Milky way new far outer arm

Dame and Thaddeus (2011) found a new outer arm in the first Galactic quadrant by detecting CO emission.

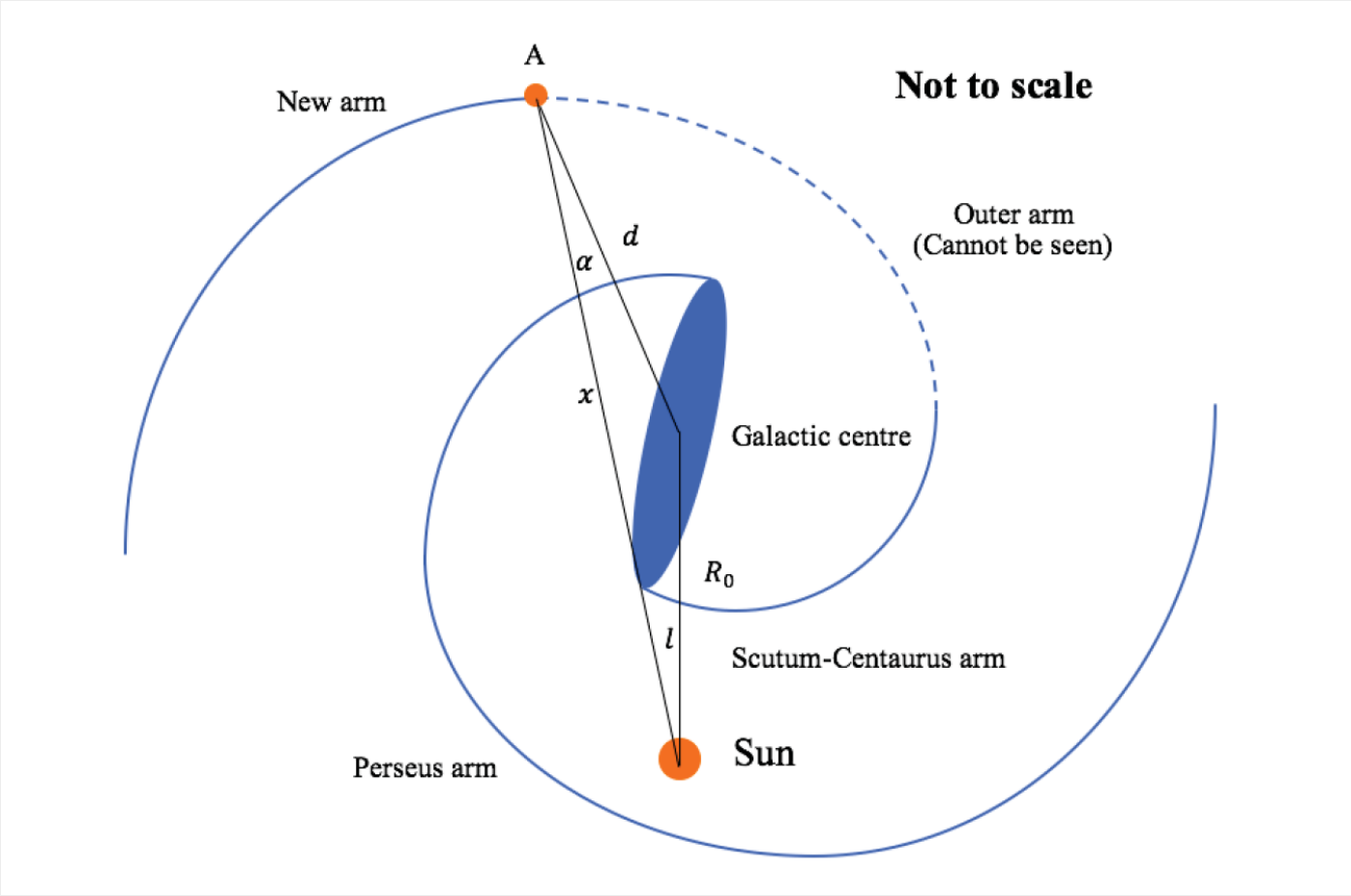
Objective: using radial velocity and flat rotation curve to determine the position of the arm.

Short Questions : T3



T. M. Dame and P. Thaddeus (2011). A Molecular Spiral Arm in the Far Outer Galaxy. ApJ Letters

Short Questions : T3



Short Questions : T4

T4. 21-cm HI galaxy survey

- Suppose we have a radio telescope for large-scale galaxy survey using HI spin-flip at rest frequency 1.42Hz.

- The frequency range of the receivers is from 1.32 to 1.52 GHz

- Its detection limit is 50mJy for 60s observing time and channel bandwidth of 1 MHz.

Short Questions : T4

Objective: Find the **highest redshift** for a HI galaxy that can be observed by this telescope. Typical luminosity of the target galaxies is 10^{28} W.

1. Need to consider the frequency limit (142GHZ -> 132 GHz → $z < 0.07$

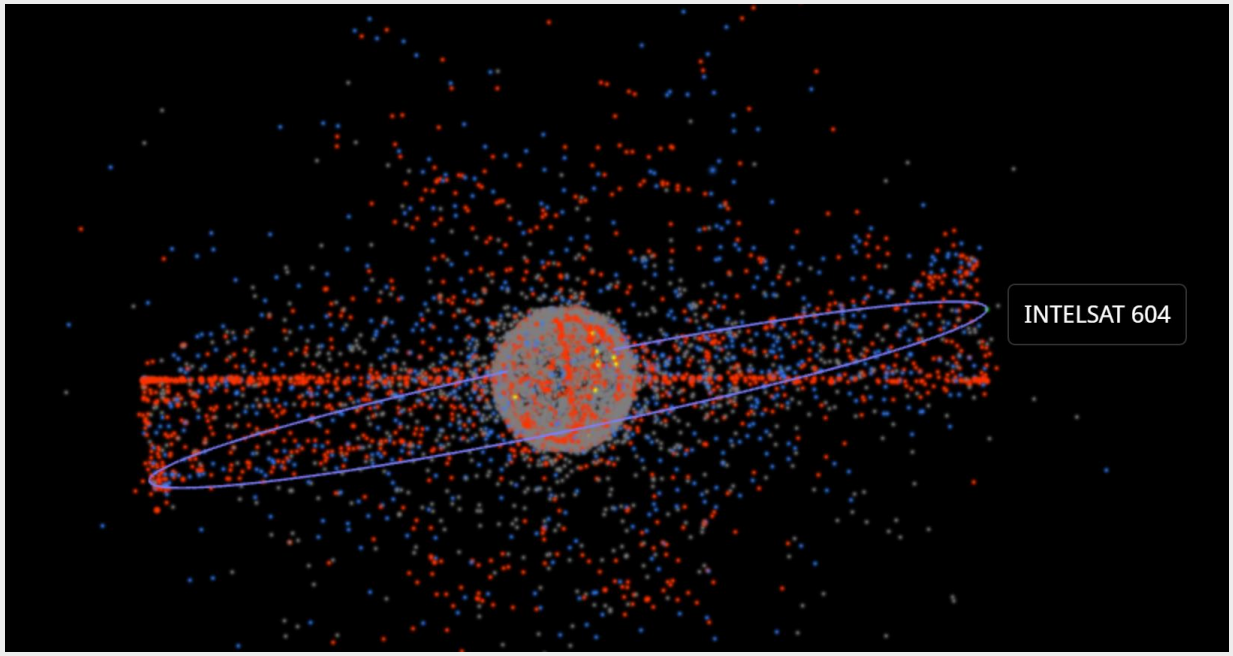
2. Need to consider the sensitivity

$$S = \frac{LH_0^2}{4\pi\Delta f c^2 z^2} = S_{\lim} = 0.5\times10^{-26} \qquad z < 0.09$$

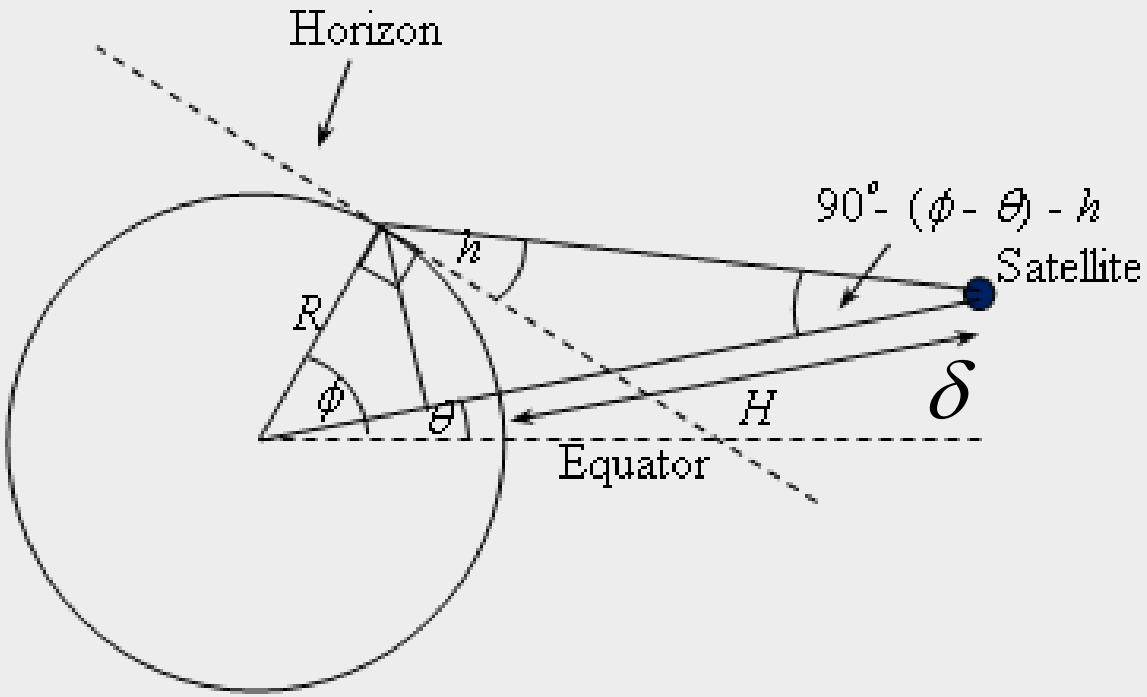
Short Questions : T5

T5. Inclined Synchronous Orbit

Objective: Find the maximum altitude of an inclined synchronous orbit.



Short Questions : Q5



Proper calculation: h = 38.4°

(rough estimate: h = 45.2°

Short Questions : Knowledge

- Q1 : **Coordinates & Times** (celestial sphere)
- Q2 : **Stellar system** (exoplanet)
- Q3 : **Stellar system** (Milky Way galaxy), Celestial mechanics
- Q4 : **Instrumentations & Space technologies** (multi-wavelength astronomy)
- Q5 : **Celestial mechanics**