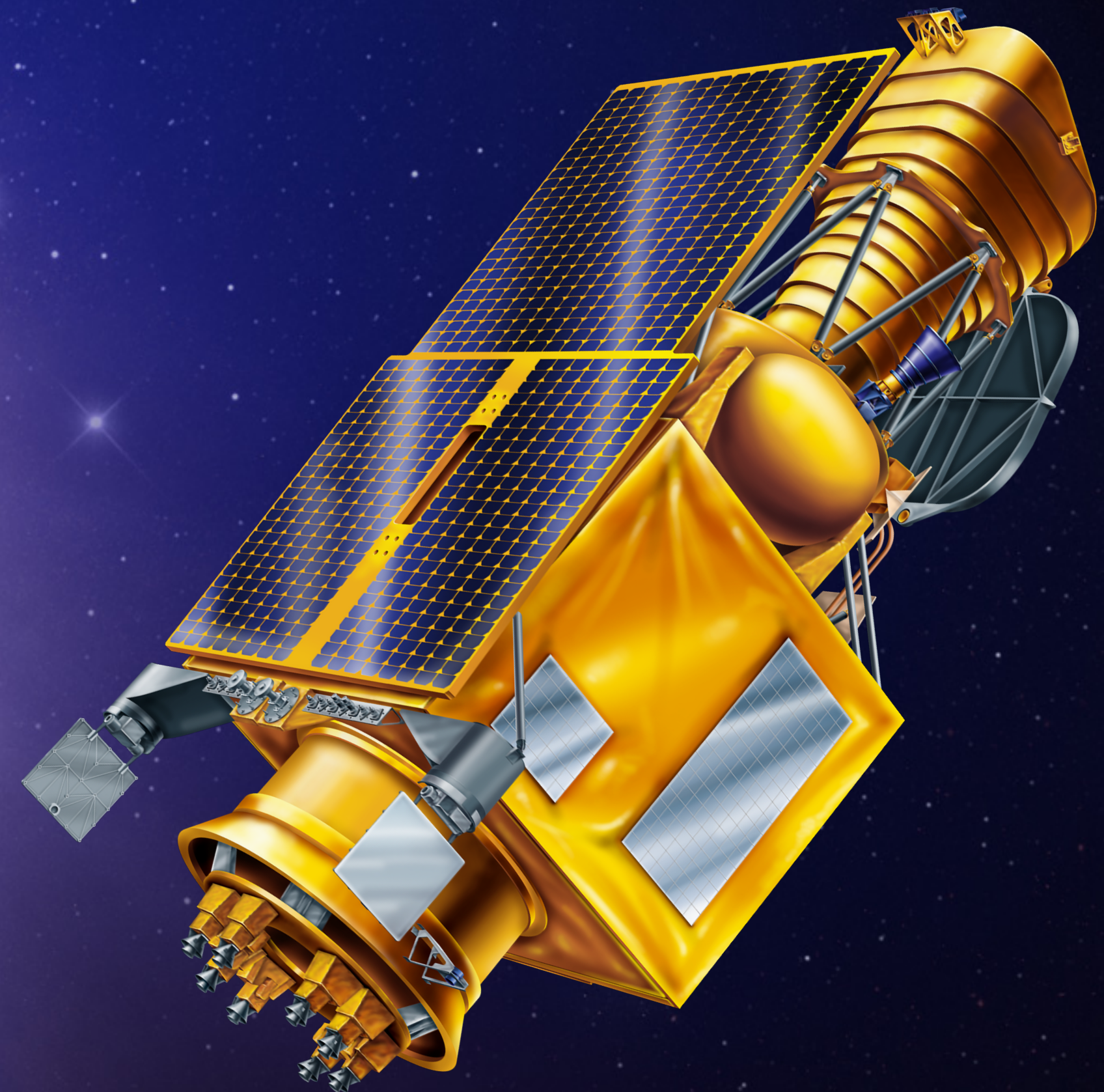


ULTRASAT: Der weite Blick ins Ungesehene

Eine astronomische Satellitenmission



Julian von Hoerschelmann-Schliwinski
DESY Campus Seminar - 11.01.2024



HELMHOLTZ



ULtraviolet
TRansient
Astronomy
SATellite



ULtraviolet→ Sensitivität
TRansient
Astronomy
SATellite



ULtraviolet→ Sensitivität
TRansient→ Ziel
Astronomy
SATellite



ULtraviolet→ Sensitivität
TRansient→ Ziel
Astronomy→ Wissenschaft
SATellite



UL traviolet	▶	Sensitivität
TR ansient	▶	Ziel
A stronomy	▶	Wissenschaft
SAT ellite	▶	Instrument

Die ULTRASAT Mission

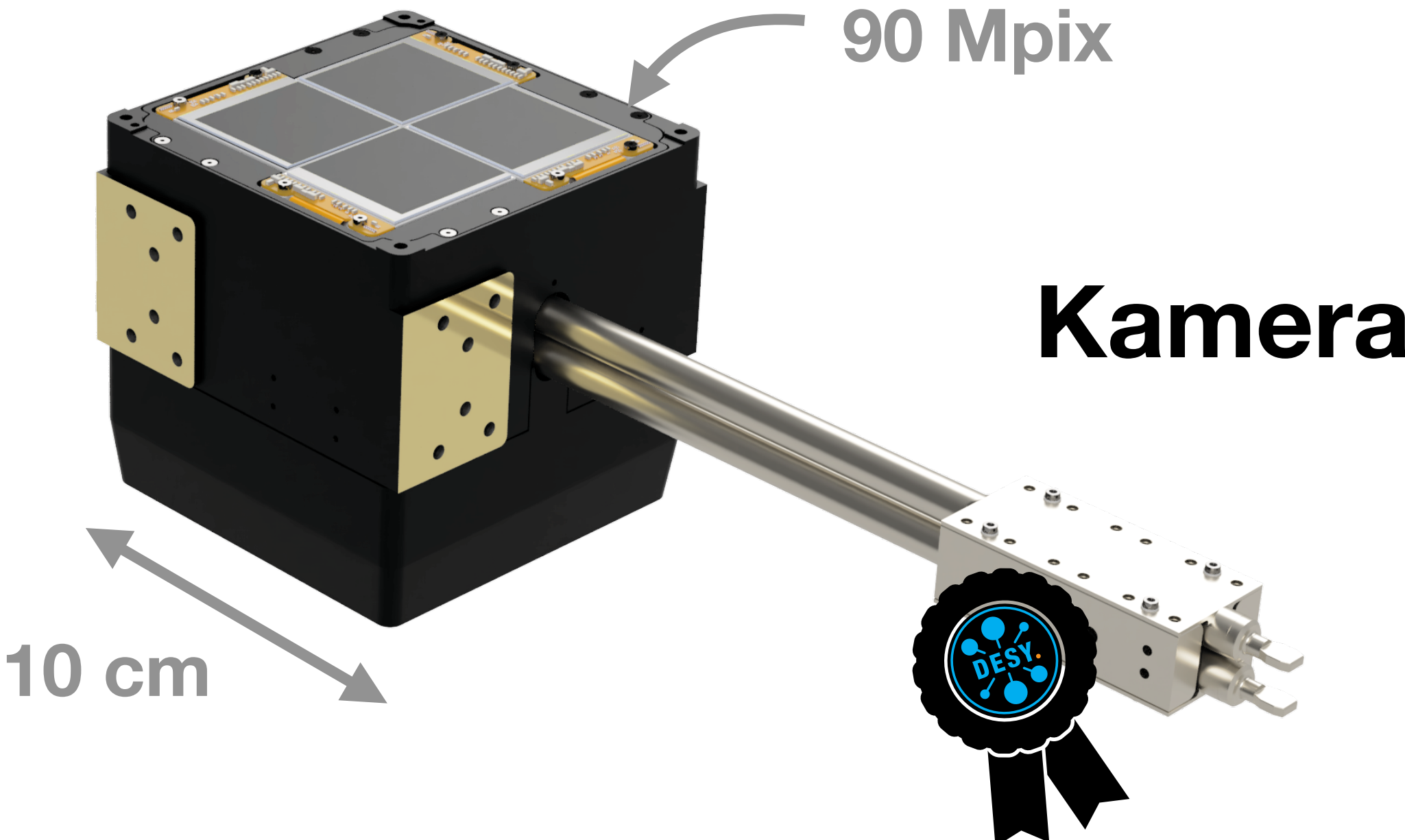
Teleskop

33 cm Öffnung

3,6 m Länge

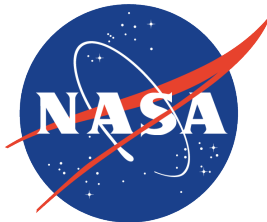
Satellit

Start: 2028 🚀

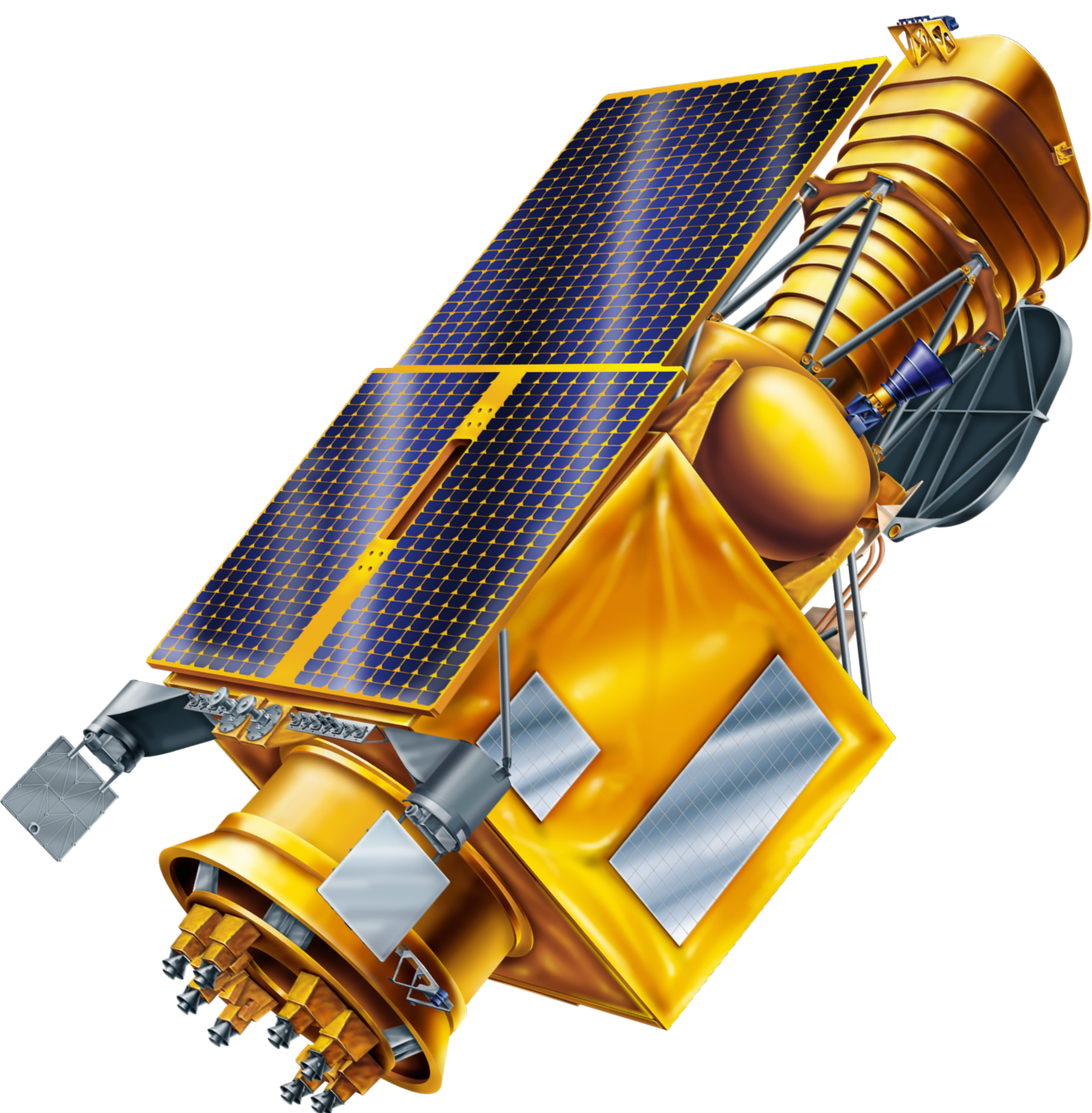


ULTRASAT Camera Team
@ DESY

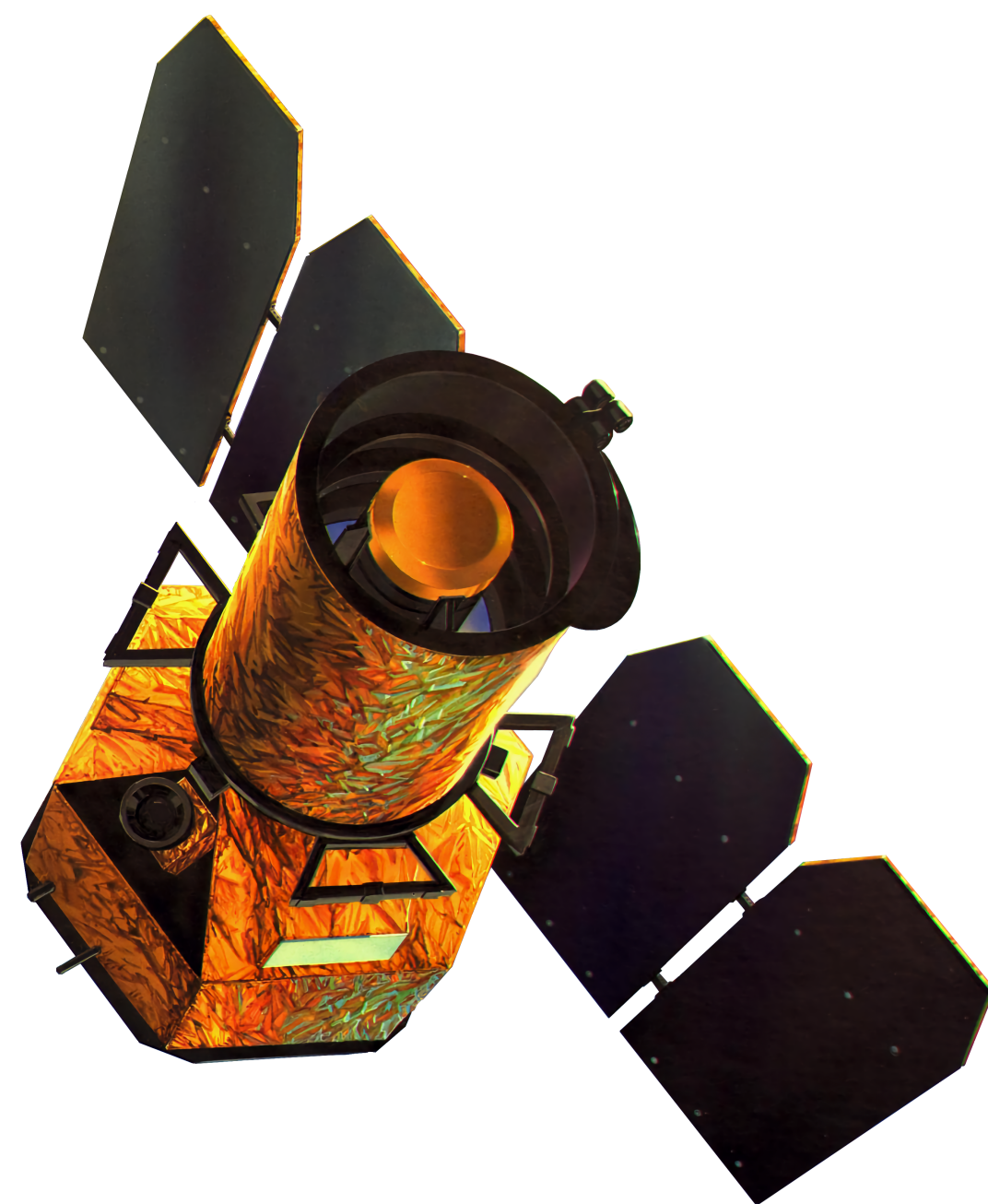
Partner



ULTRASAT im Vergleich



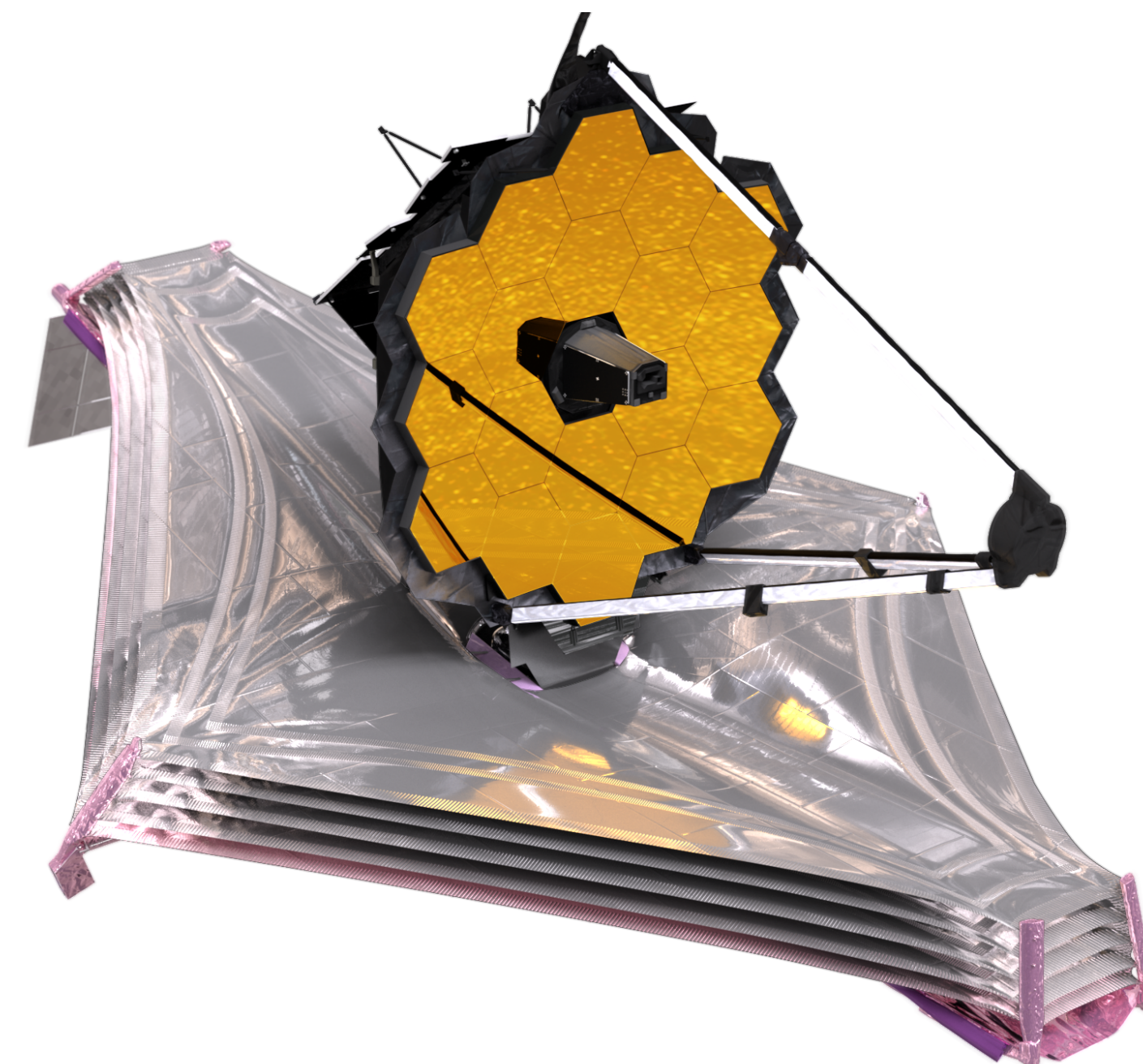
ULTRASAT
2028 →



GALEX
2003 → 2013



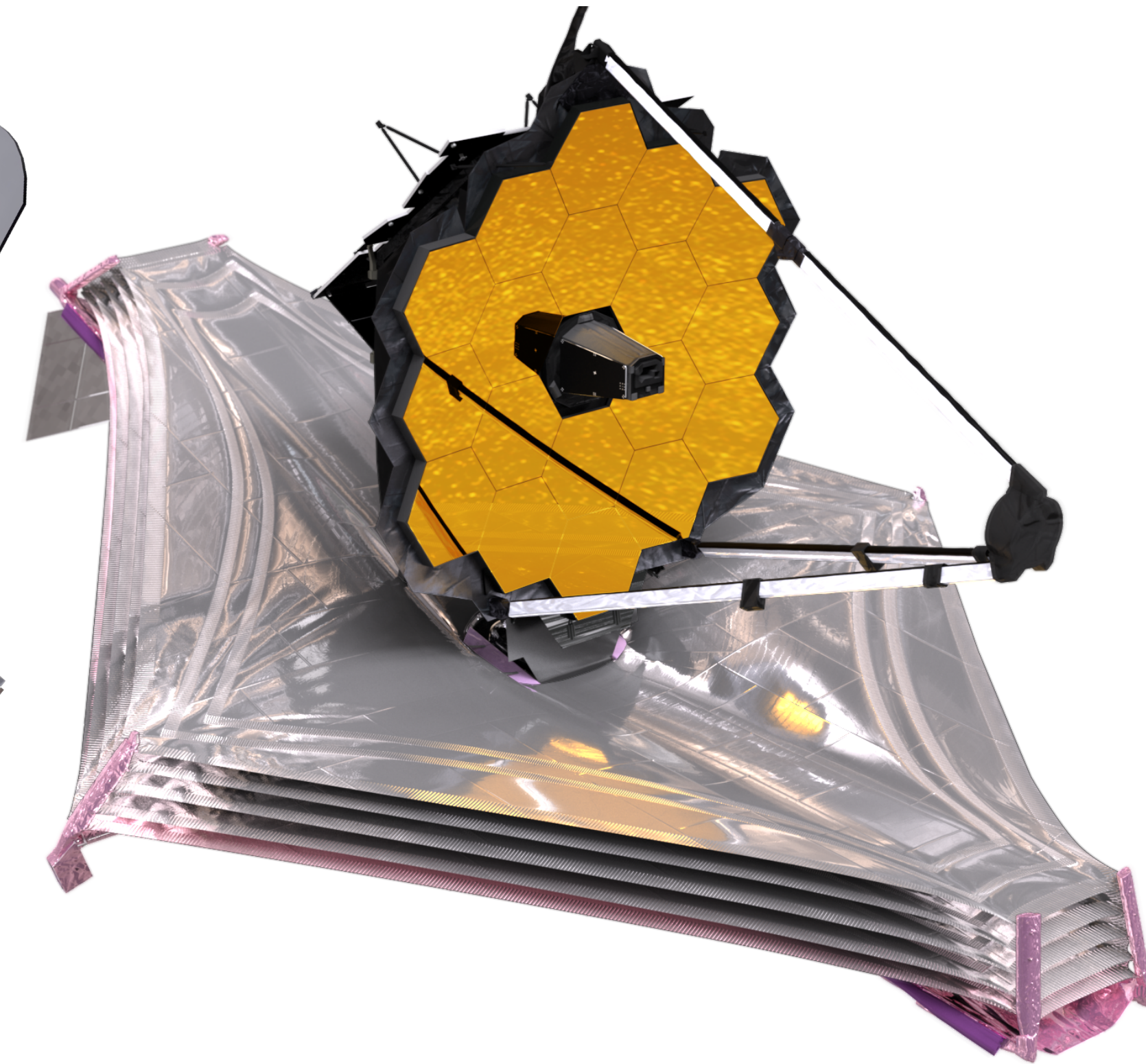
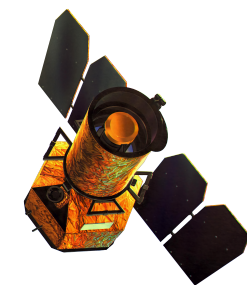
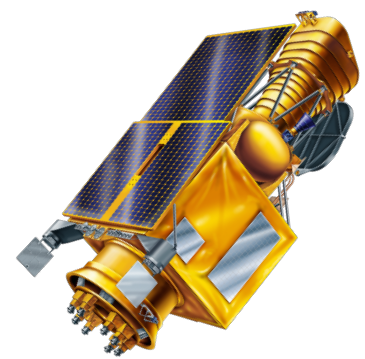
Hubble
1990 →



Webb (JWST)
2021 →

ULTRASAT im Vergleich

Länge  [m]



ULTRASAT
3,6

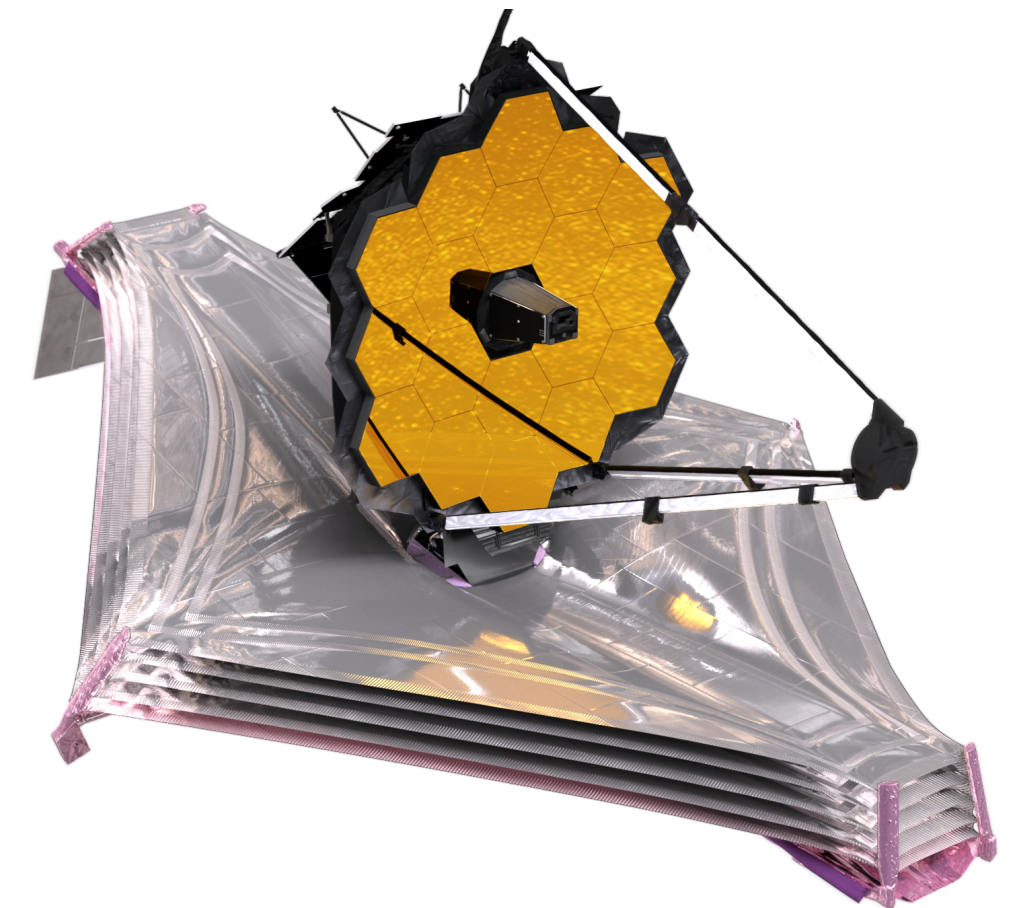
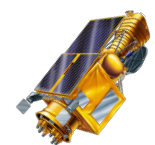
GALEX
2,5

Hubble
13

Webb (JWST)
14

ULTRASAT im Vergleich

Gewicht 🏋️ [t]



ULTRASAT
1,1

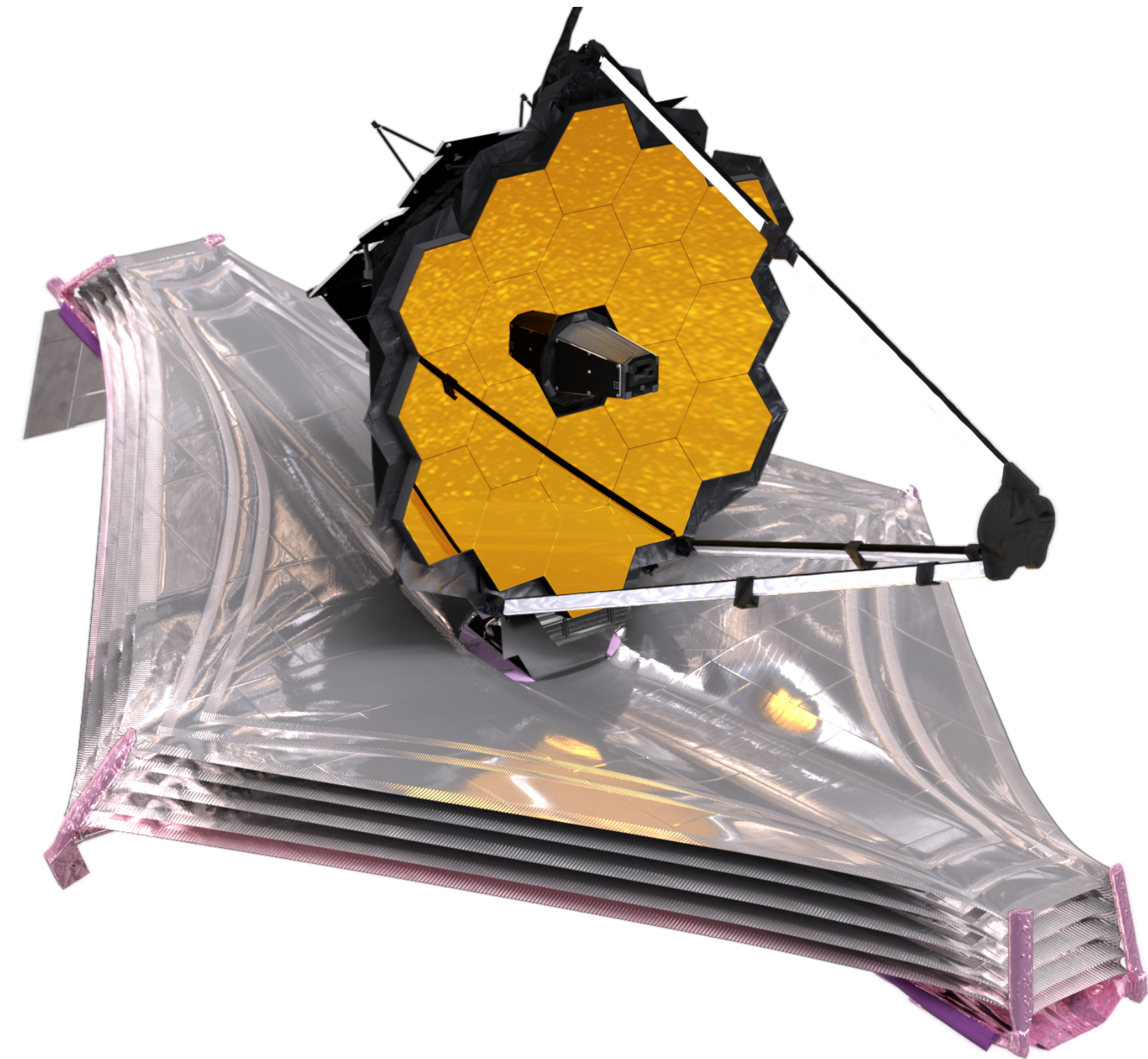
GALEX
0,3

Hubble
11

Webb (JWST)
6,5

ULTRASAT im Vergleich

Preis 💵 [Mrd\$]



ULTRASAT

0,1

(10% Kamera)

GALEX

0,15

Hubble

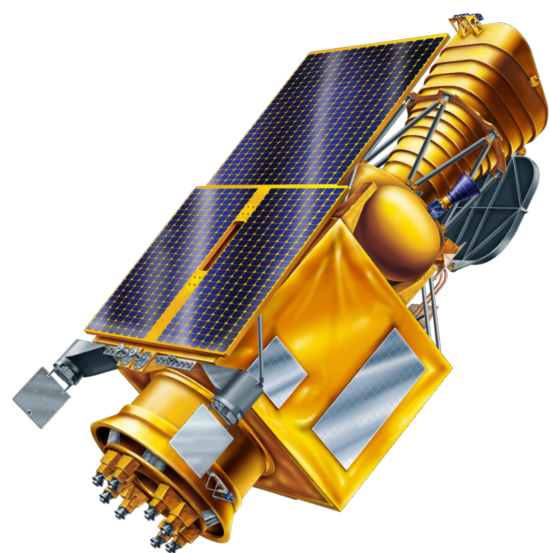
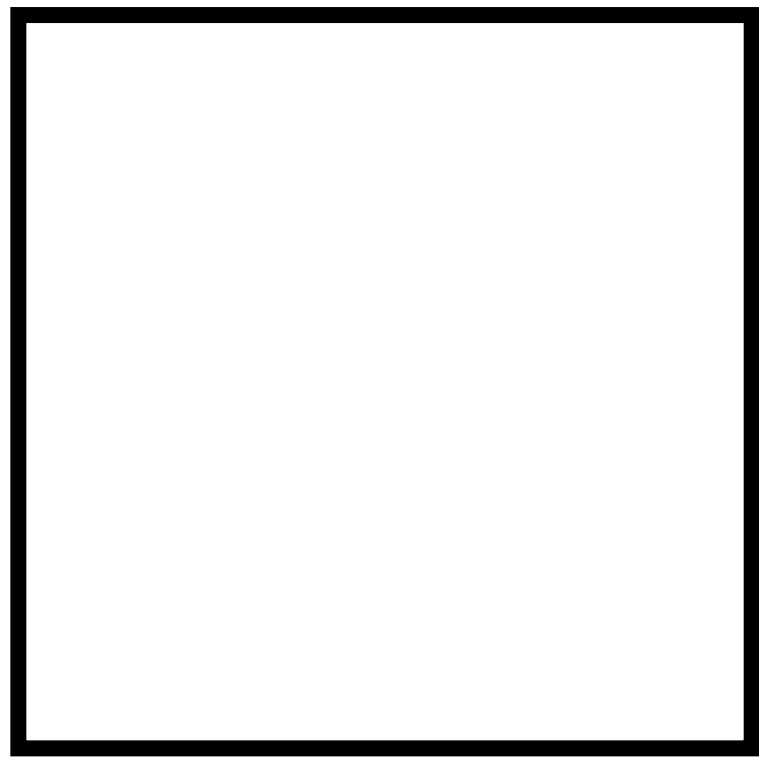
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Webb (JWST)

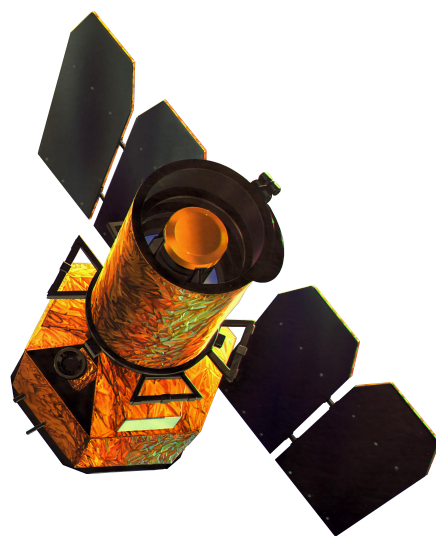
10

ULTRASAT im Vergleich

Blickfeld 🖼️ [deg²]



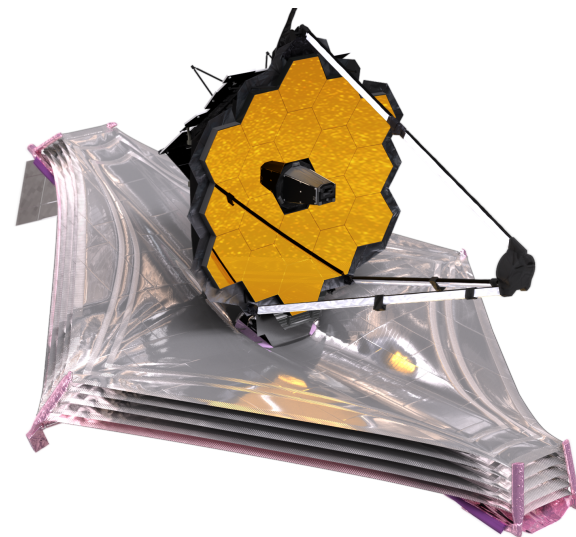
ULTRASAT
204



GALEX
1,13



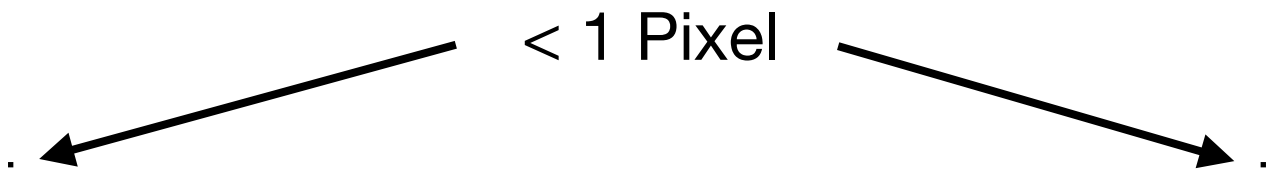
Hubble
0,002



Webb (JWST)
0,0013



Vollmond
0,2

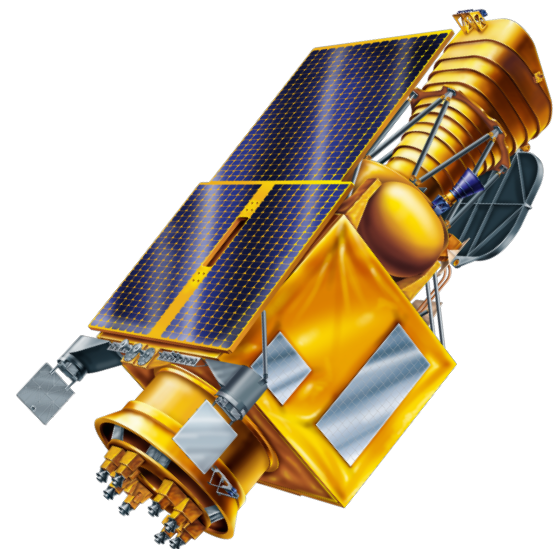


ULTRASAT im Vergleich

Blickfeld 🖼️ [deg²]



Vollmond
0,2



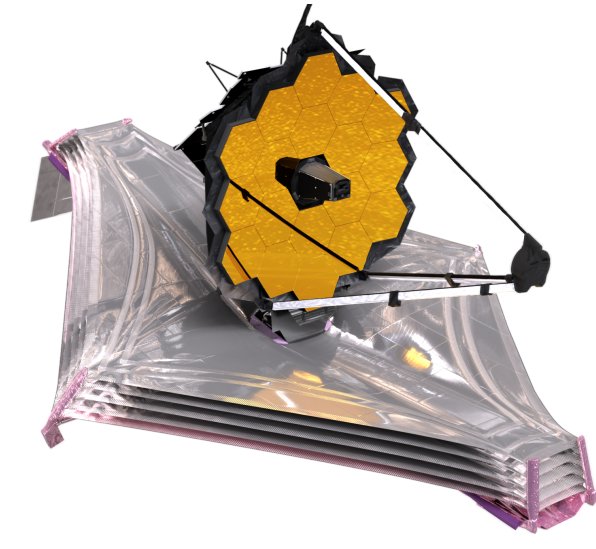
ULTRASAT
204



GALEX
1,13

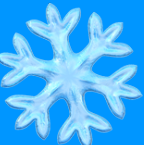


Hubble
0,002

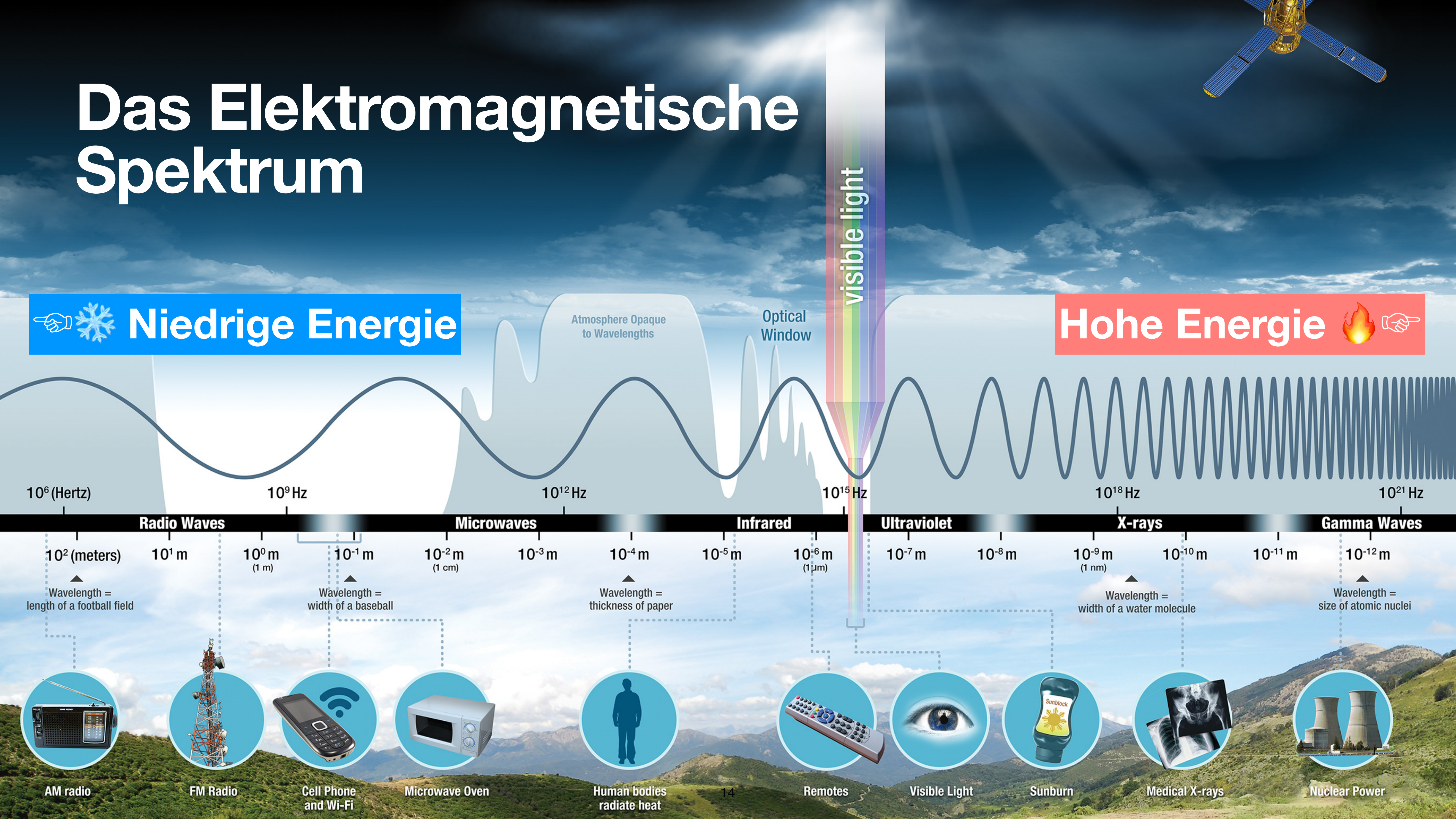


Webb (JWST)
0,0013

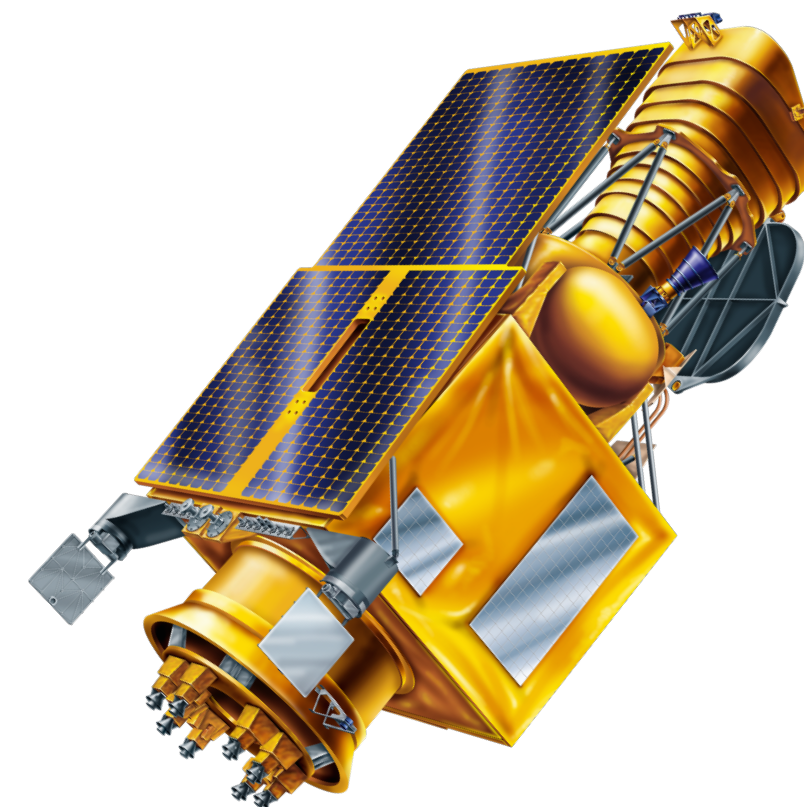
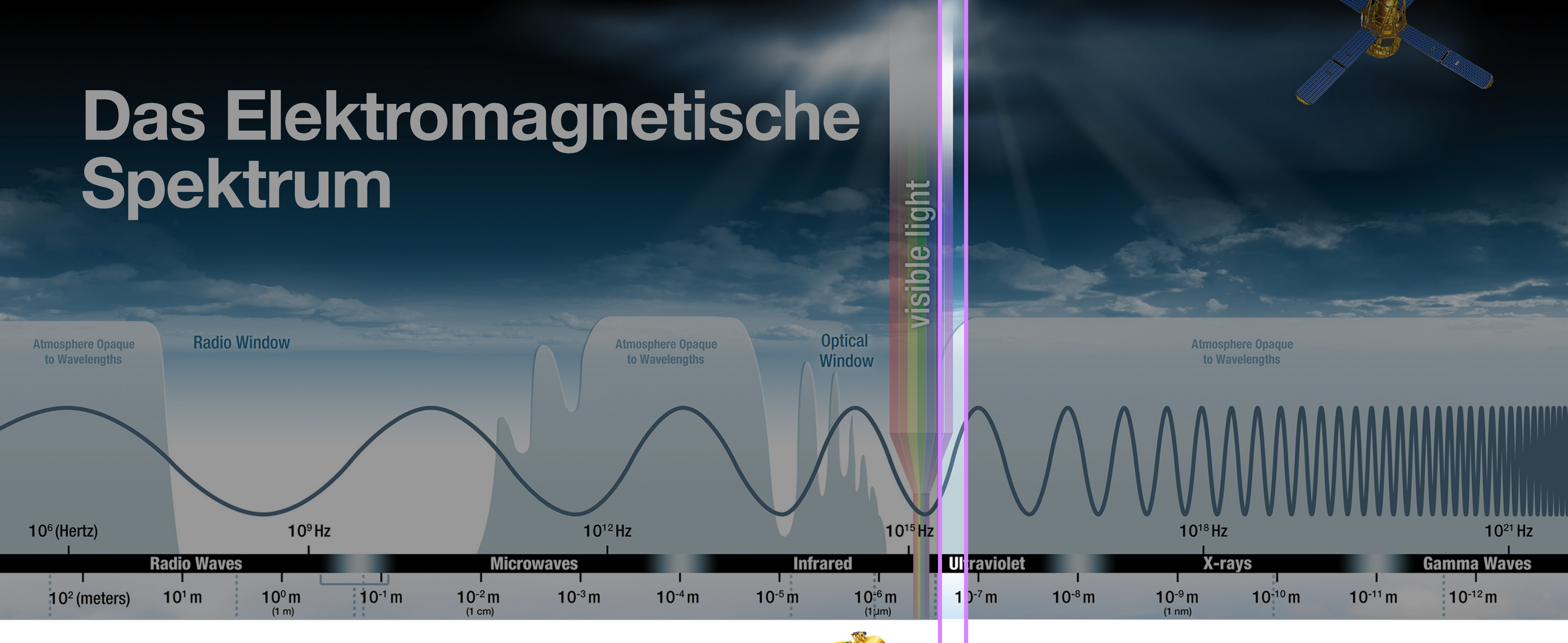
Das Elektromagnetische Spektrum

  **Niedrige Energie**

Hohe Energie  

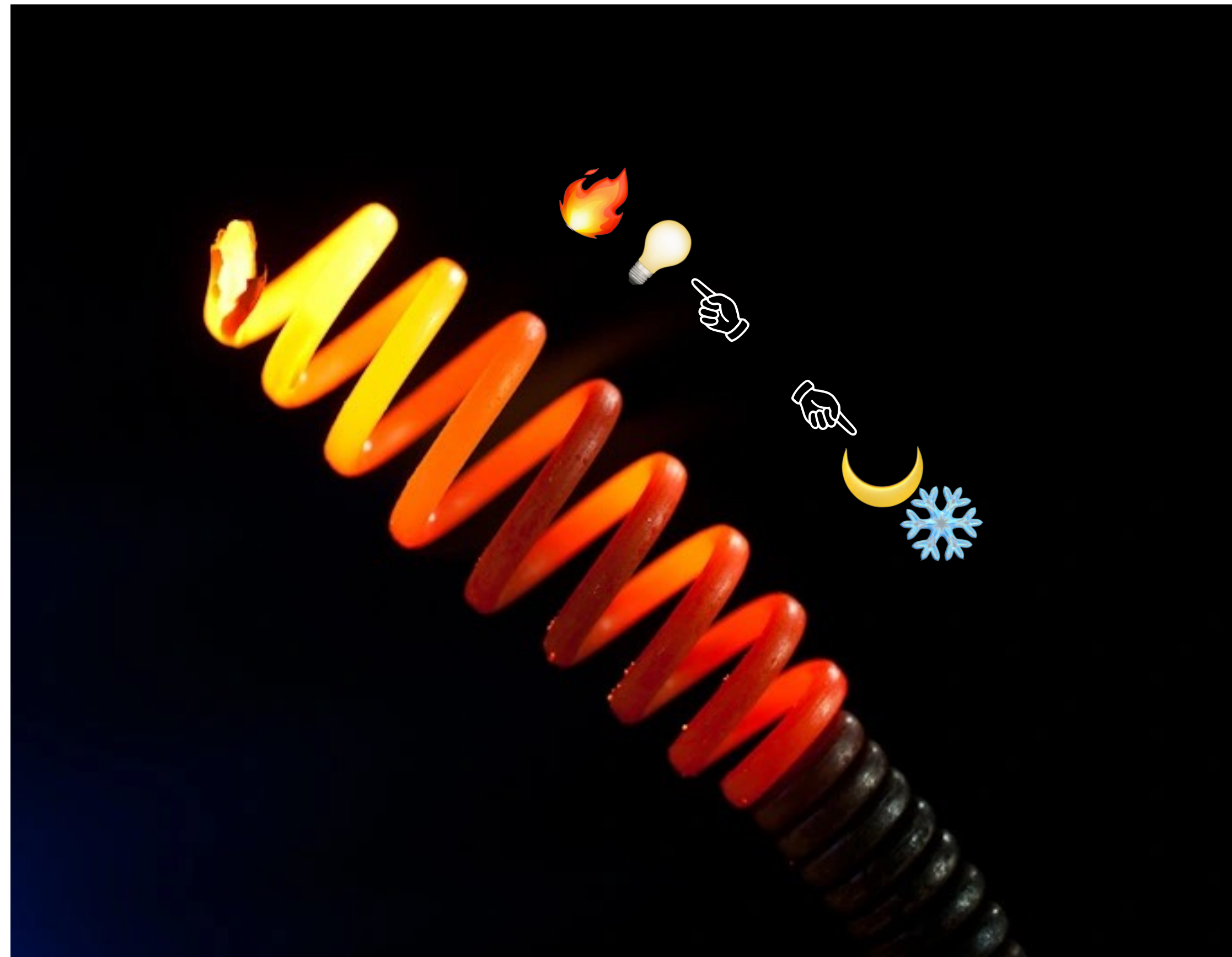


Das Elektromagnetische Spektrum

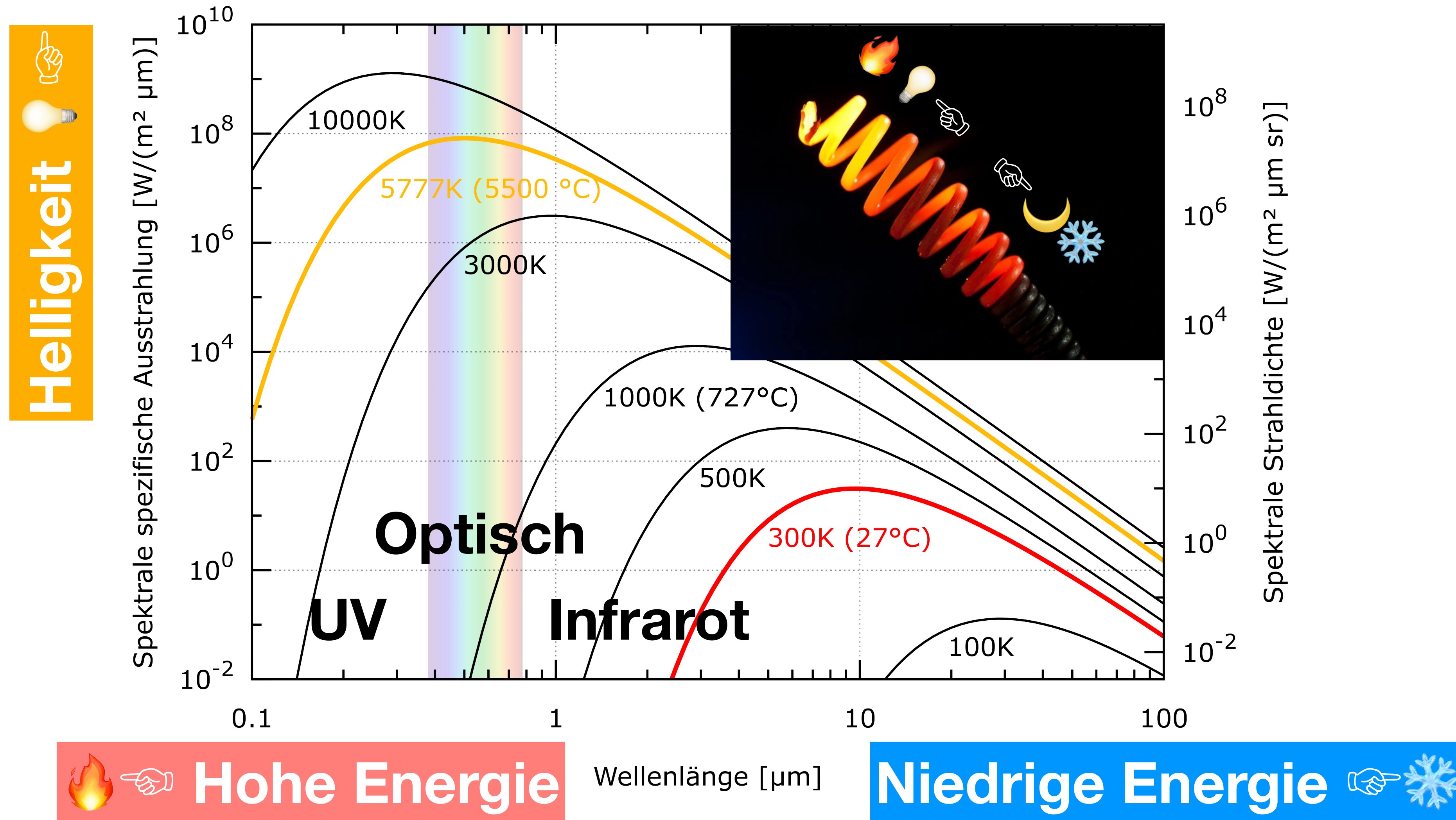


ULTRASAT
230 - 290 nm

Thermische Strahlung

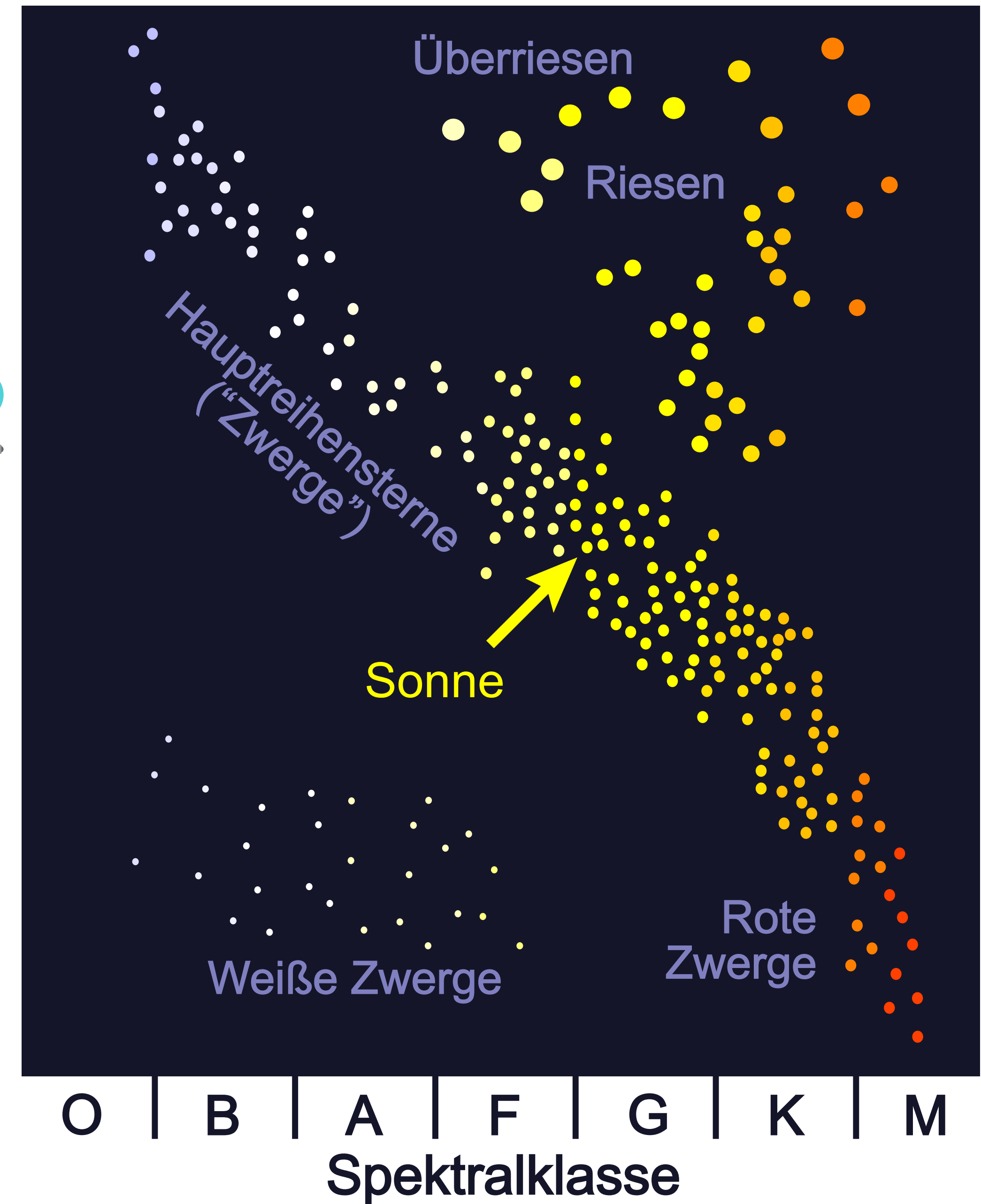


Thermische Strahlung



Thermische Strahlung der Sterne

↑
💡
Leuchtkraft

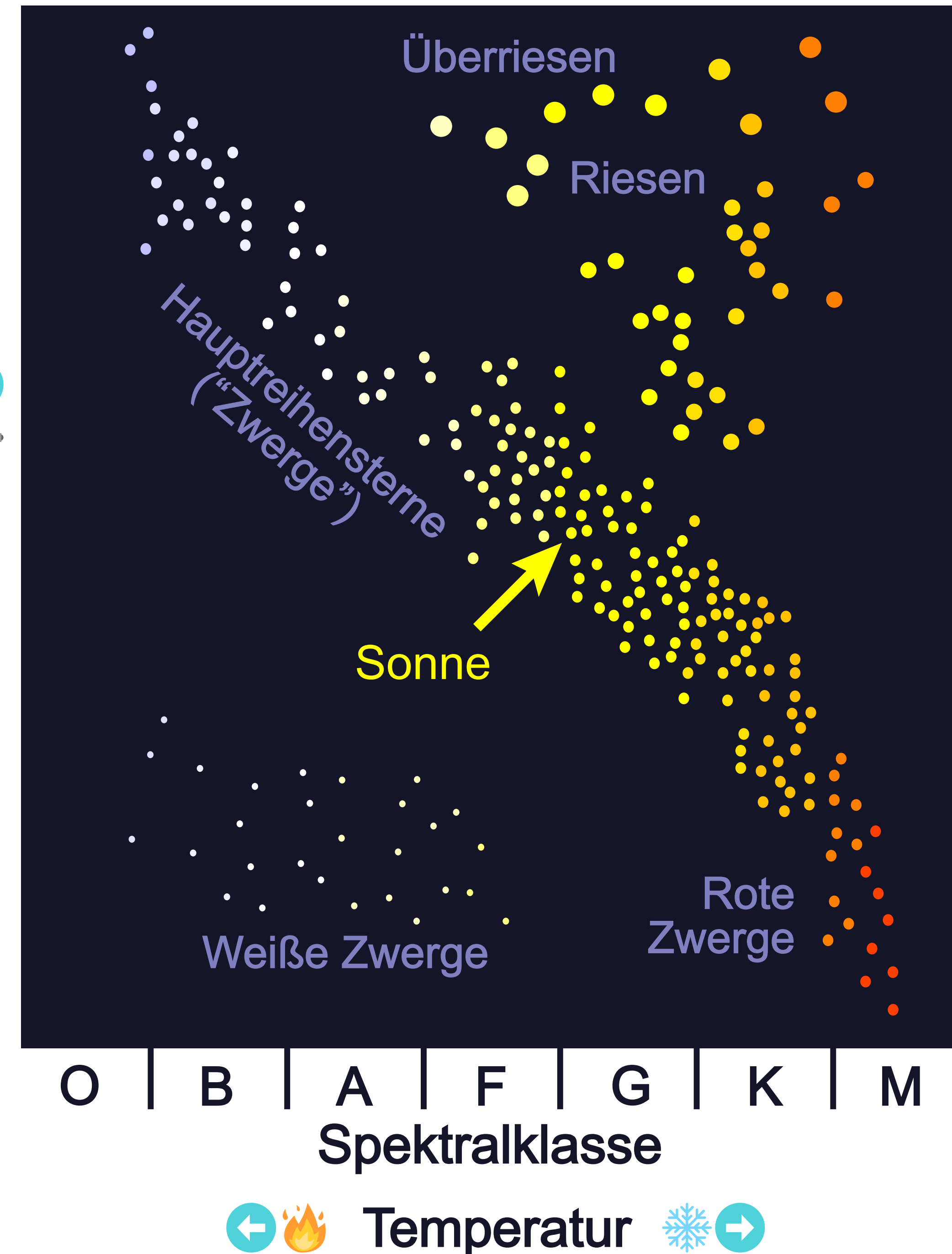


← 🔥 Temperatur ❄️ →

Thermische Strahlung der Sterne

Sehr große und sehr kleine Sterne sind UV-hell (💡 & 🔥)

↑
💡
Leuchtkraft



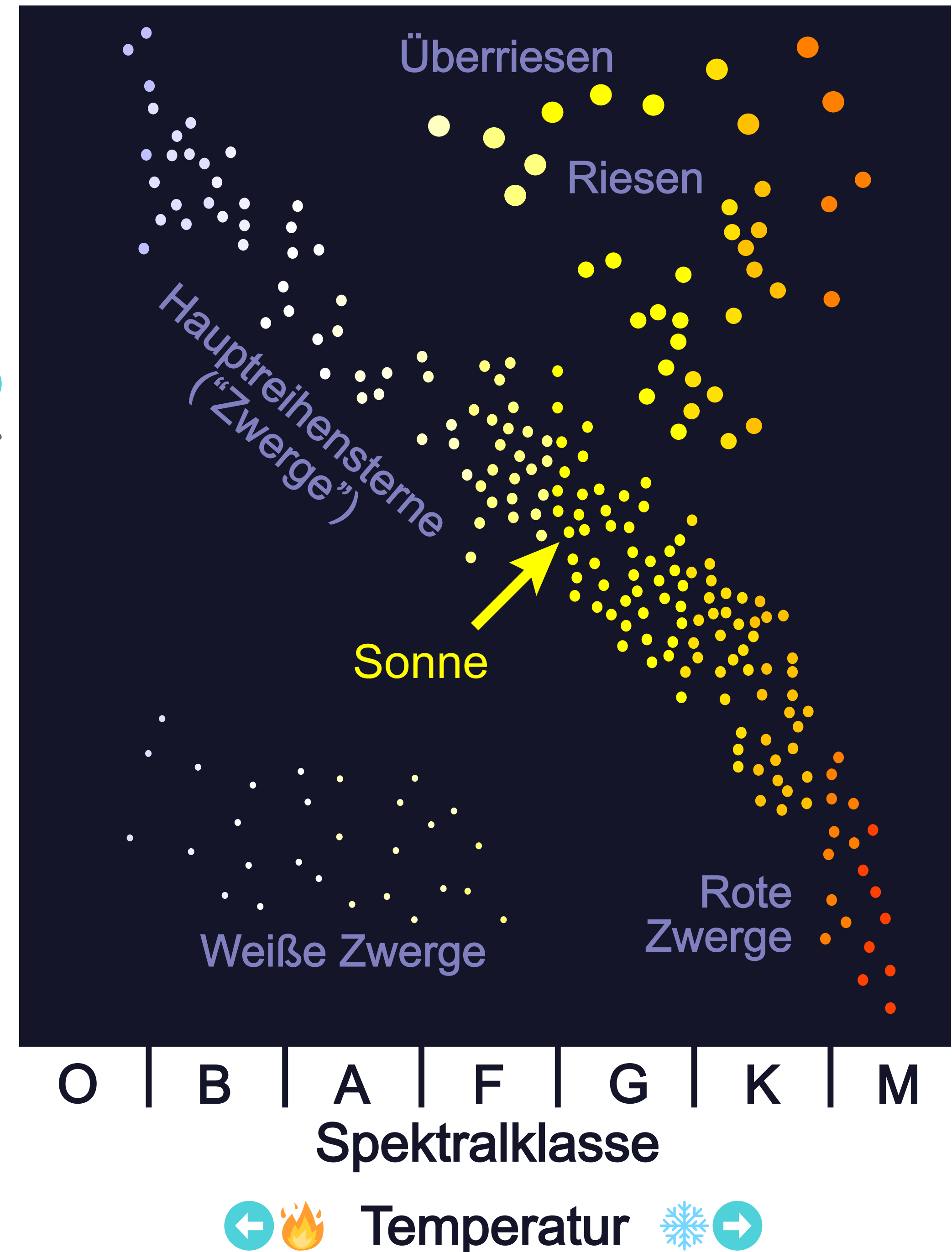
Thermische Strahlung der Sterne

Sehr große und sehr kleine
Sterne sind UV-hell (💡 & 🔥)

Welche UV-hellen Phänomene
gibt es noch im Universum?



↑
💡
Leuchtkraft



Thermische Strahlung der Sterne

Sehr große und sehr kleine
Sterne sind UV-hell (💡 & 🔥)

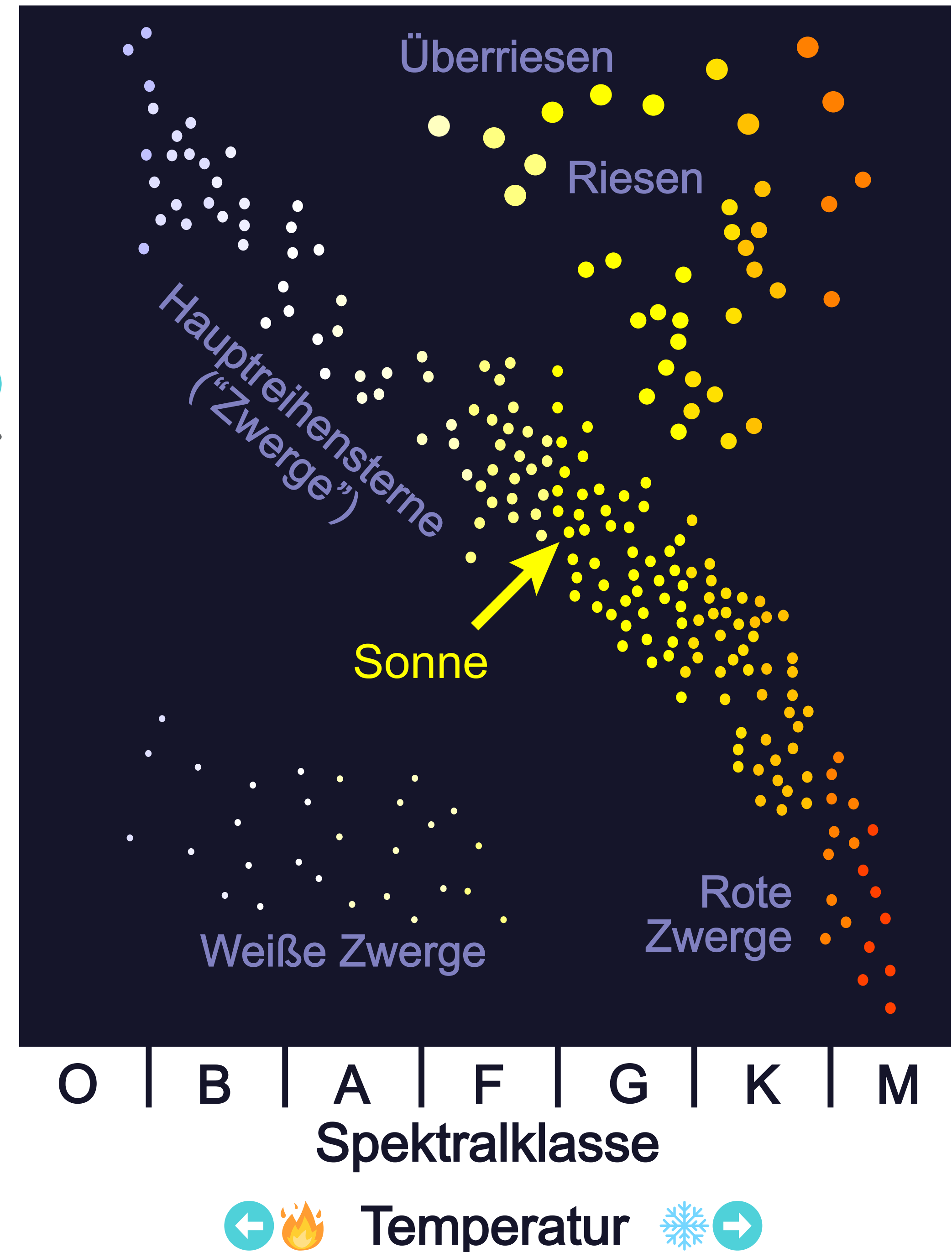
Welche UV-hellen Phänomene
gibt es noch im Universum?



z.B.

Explosionen aller Art! 🌋💥

↑
💡
Leuchtkraft



optisch

Andromeda Galaxie

UV

Andromeda Galaxie

Transiente und variable Ereignisse

(= dt.: Vorübergehend)

Andromeda Galaxie

Transiente und variable Ereignisse

(= dt.: Vorübergehend)

Aktive Galaxie Kerne

- Variabel u. wiederkehrend
- Supermassives schwarzes Loch als Motor

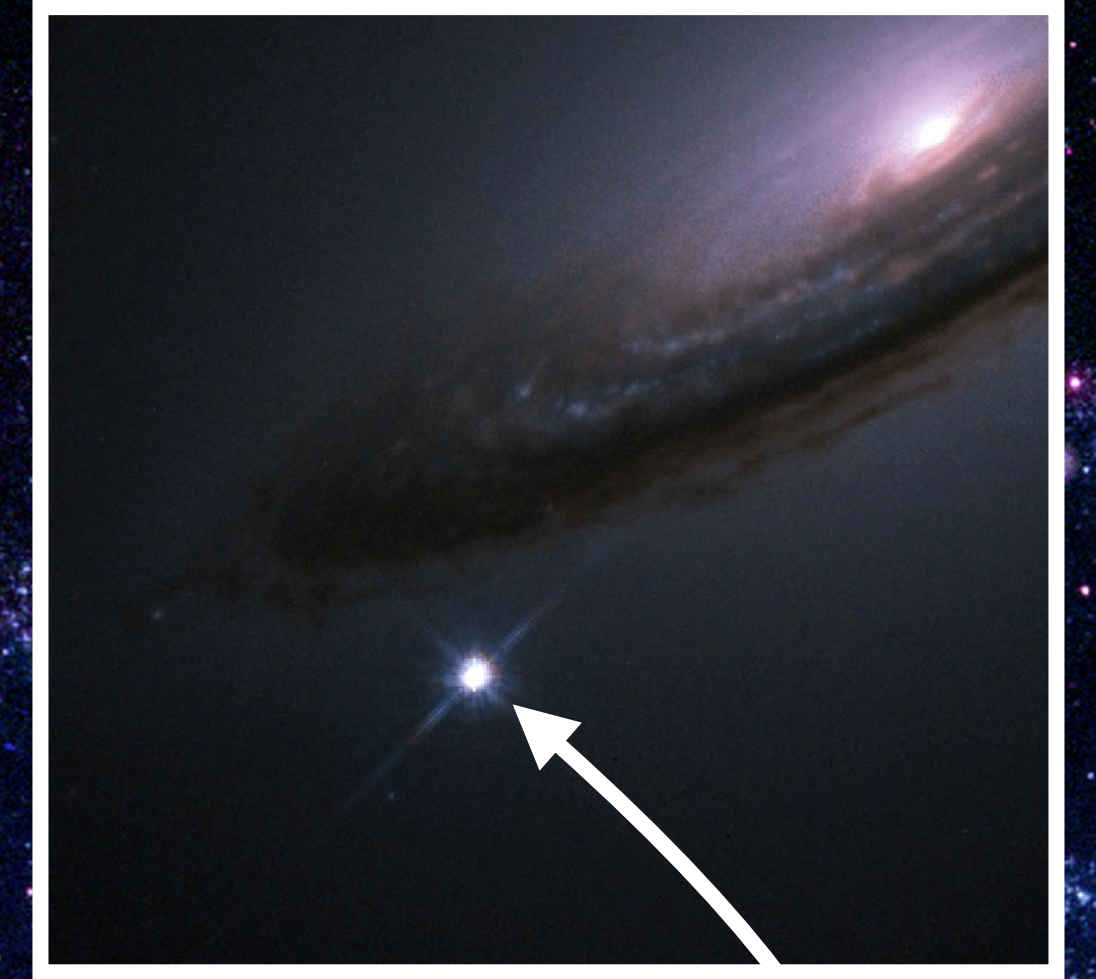


Transiente und variable Ereignisse

(= dt.: Vorübergehend)

Aktive Galaxie Kerne

- Variabel u. wiederkehrend
- Supermassives schwarzes Loch als Motor



Supernova

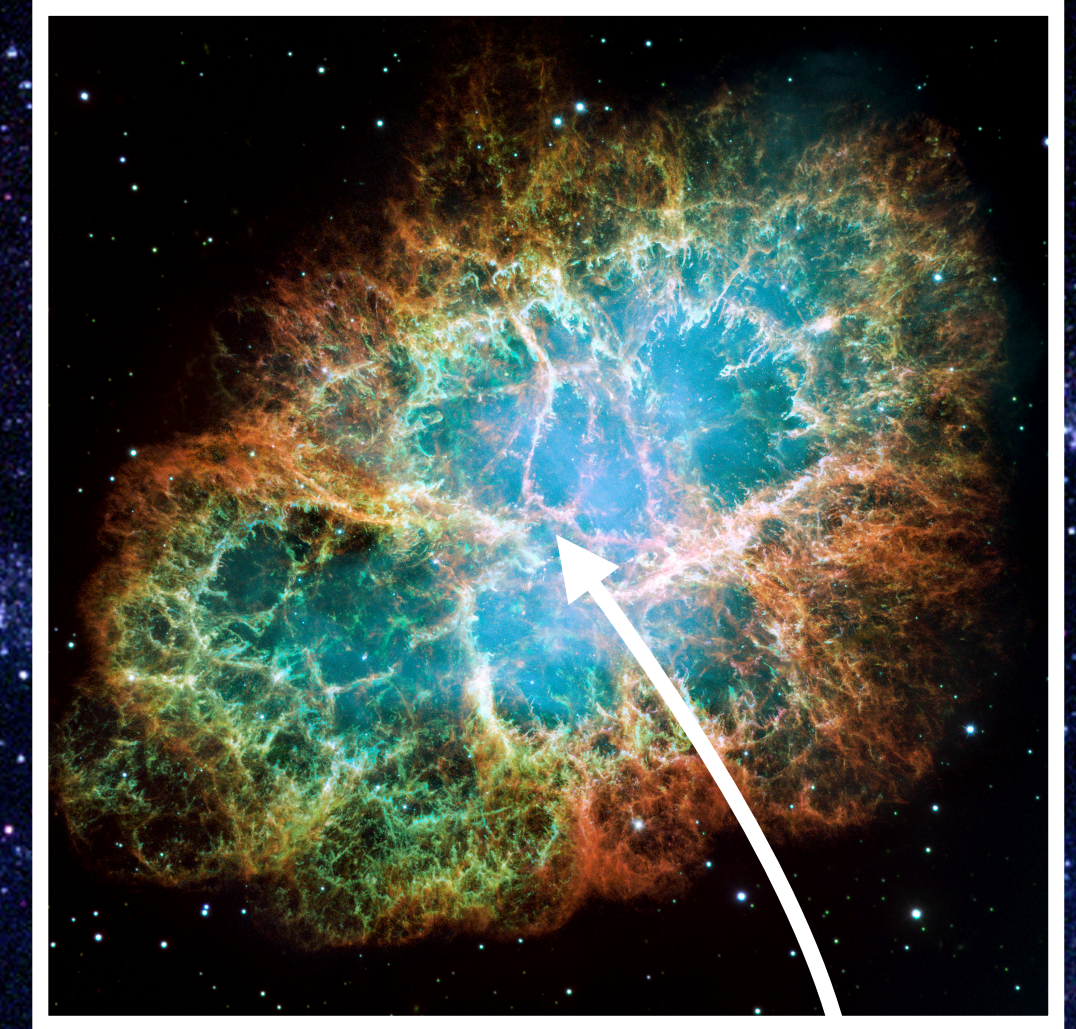
- Transient und einmalig
- z.B. Kollaps eines Sterns zum Ende seiner Lebenszeit
- ULTRASAT Hauptziel 2

Transiente und variable Ereignisse

(= dt.: Vorübergehend)

Aktive Galaxie Kerne

- Variabel u. wiederkehrend
- Supermassives schwarzes Loch als Motor



Supernova

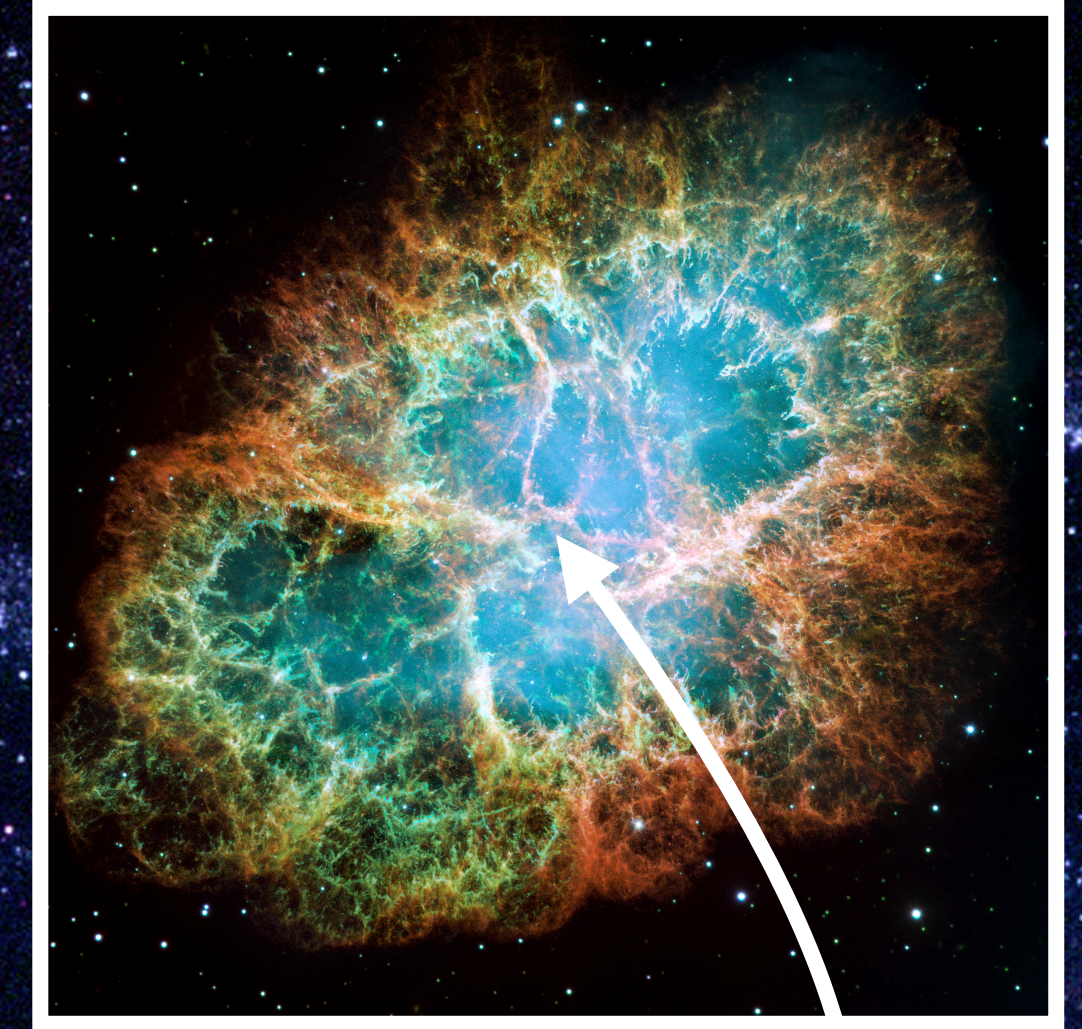
- Transient und einmalig
- z.B. Kollaps eines Sterns zum Ende seiner Lebenszeit
- ULTRASAT Hauptziel 2

Transiente und variable Ereignisse

(= dt.: Vorübergehend)

Aktive Galaxie Kerne

- Variabel und wiederkehrend
- Supermassives schwarzes Loch als Motor

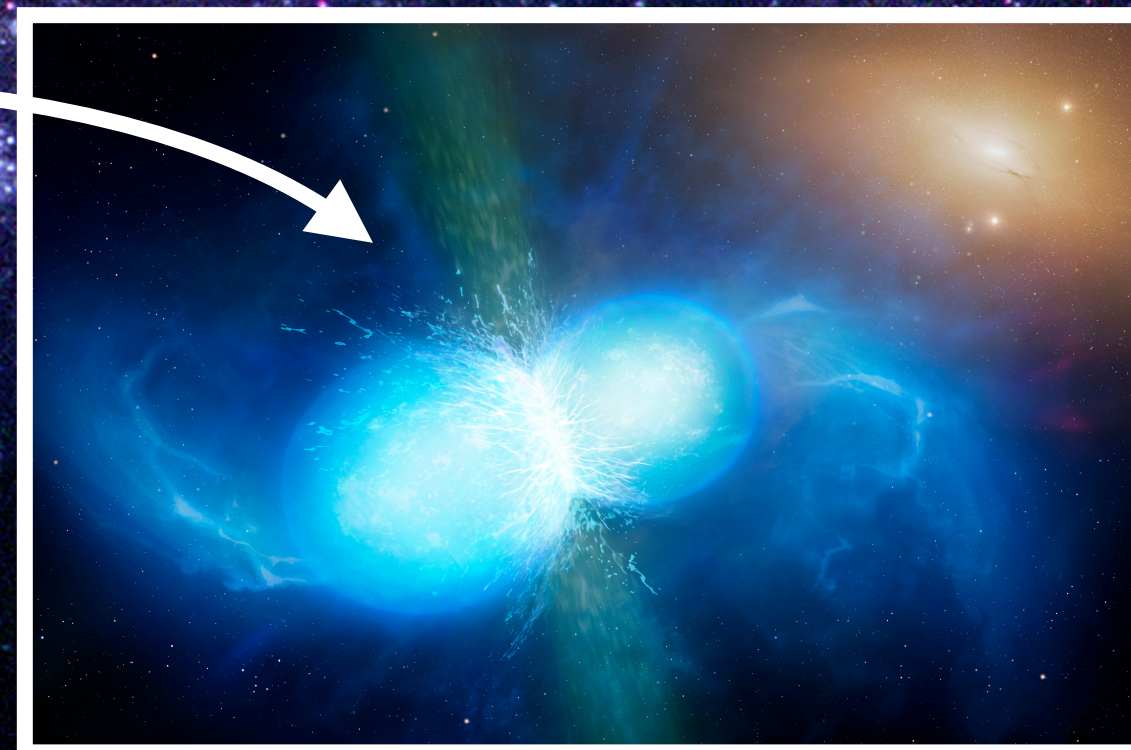


Supernova

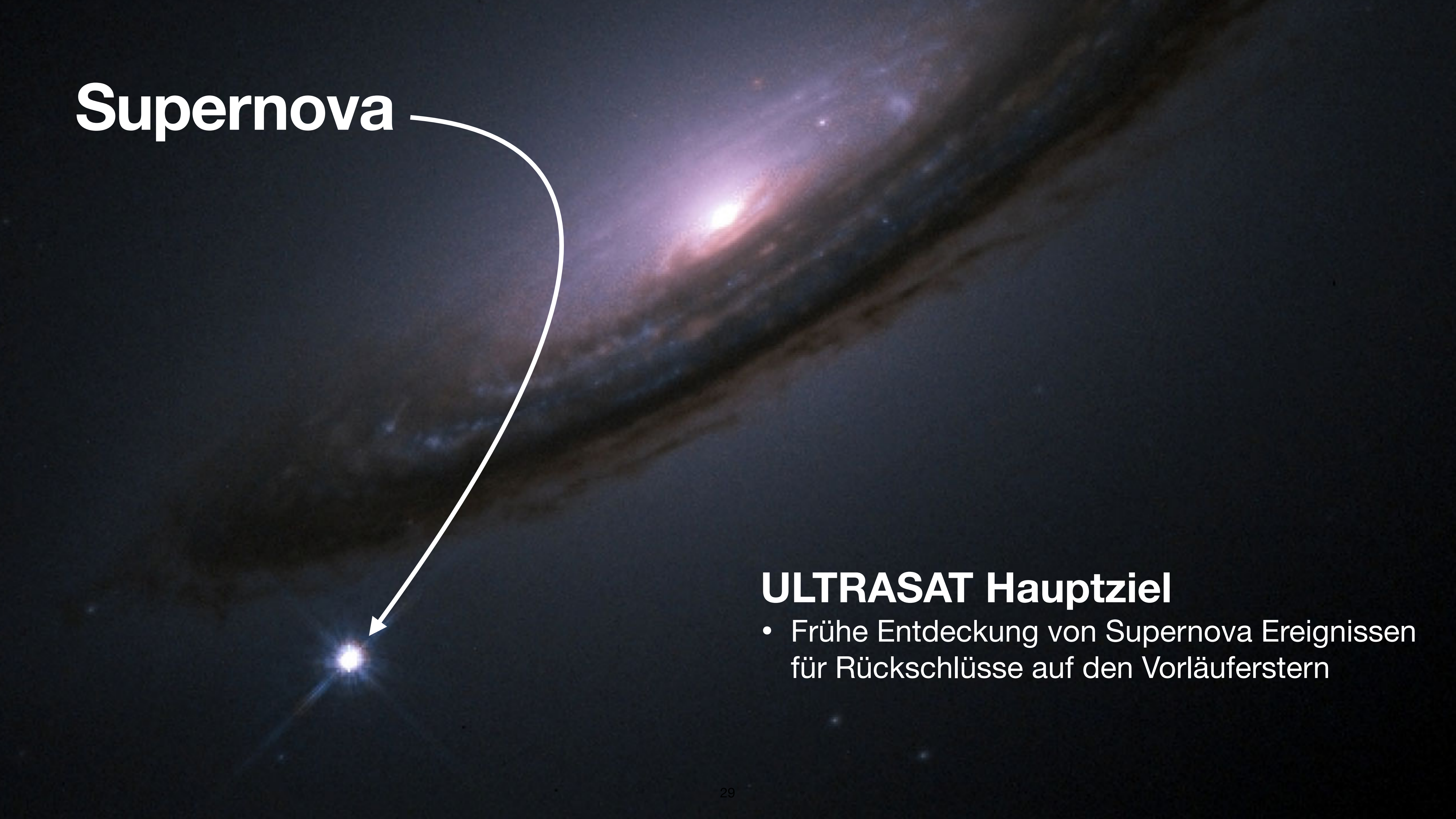
- Transient und einmalig
- z.B. Kollaps eines Sterns zum Ende seiner Lebenszeit
- ULTRASAT Hauptziel 2

Kilonova

- Transient und einmalig
- Verschmelzung zweier Neutronensterne
- ULTRASAT Hauptziel 1



Supernova



ULTRASAT Hauptziel

- Frühe Entdeckung von Supernova Ereignissen für Rückschlüsse auf den Vorläuferstern

Exkurs: Lichtkurven


Helligkeit 

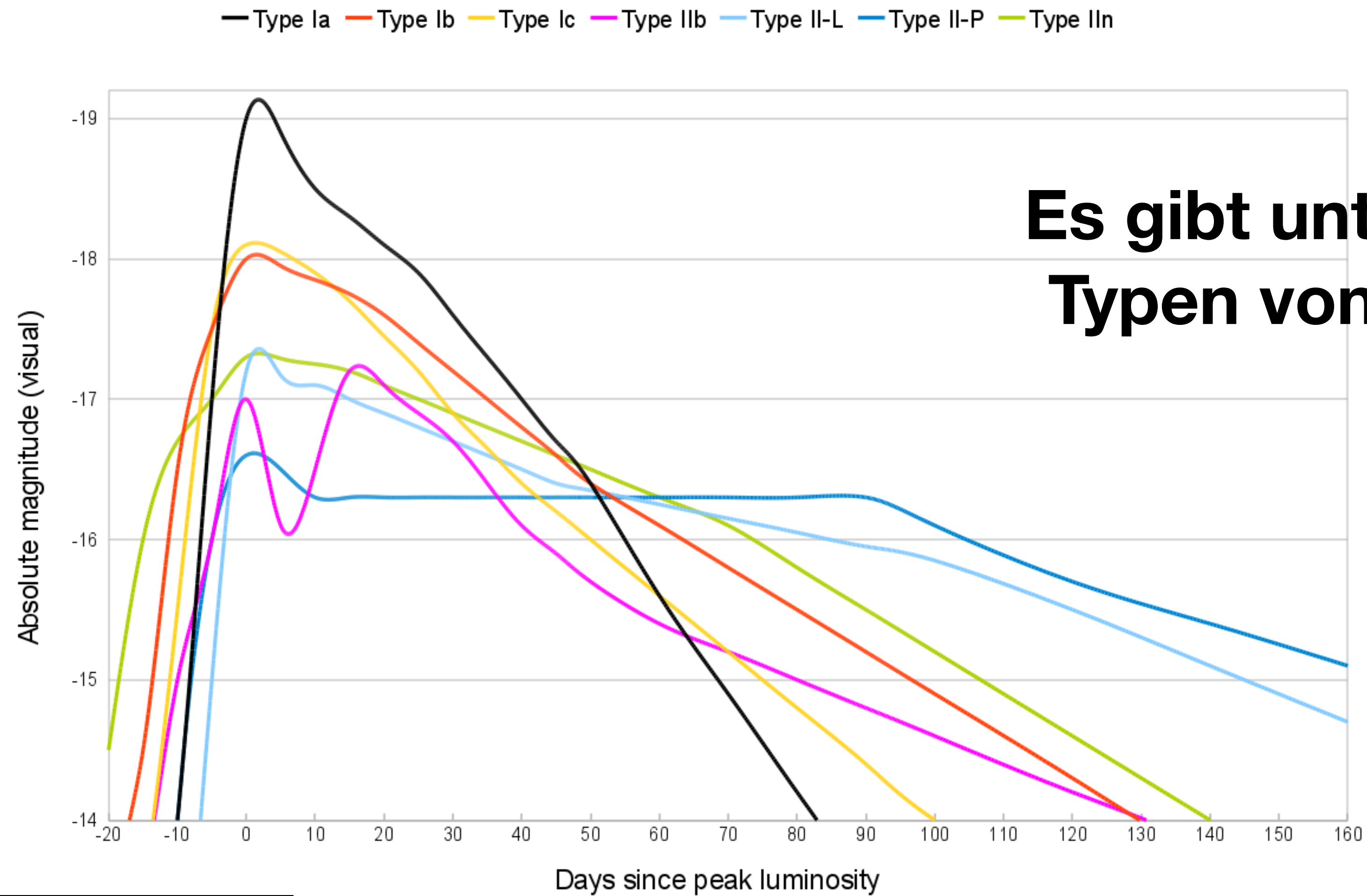


Zeit  

Exkurs: Lichtkurven

Helligkeit  

Zeit  



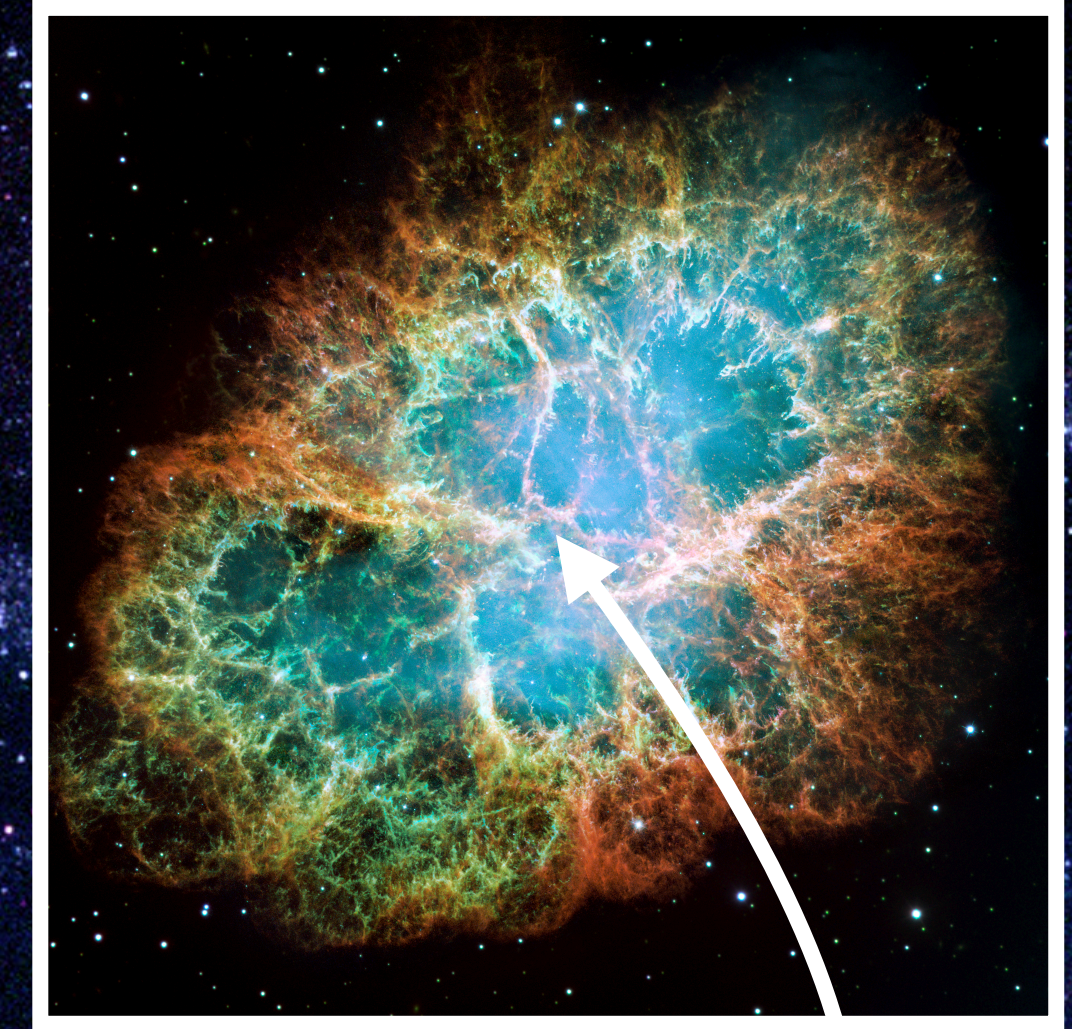
Es gibt unterschiedliche
Typen von Supernovae

Transiente und variable Ereignisse

(= dt.: Vorübergehend)

Aktive Galaxie Kerne

- Variabel und wiederkehrend
- Supermassives schwarzes Loch als Motor

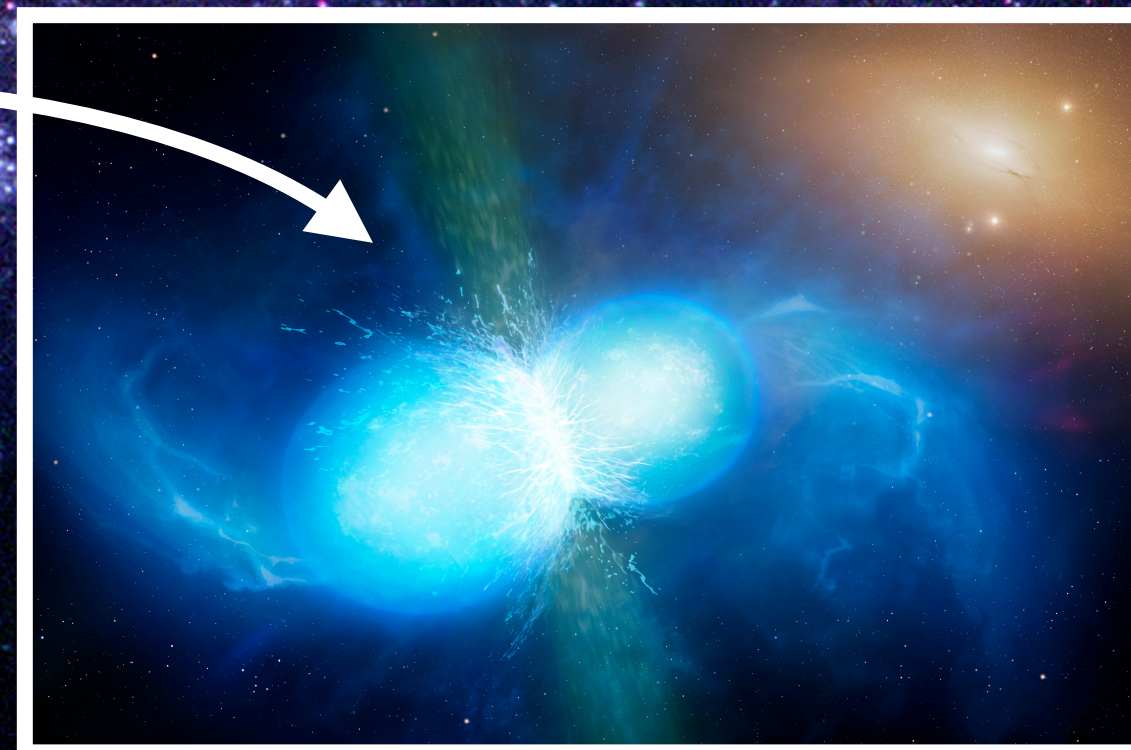


Supernova

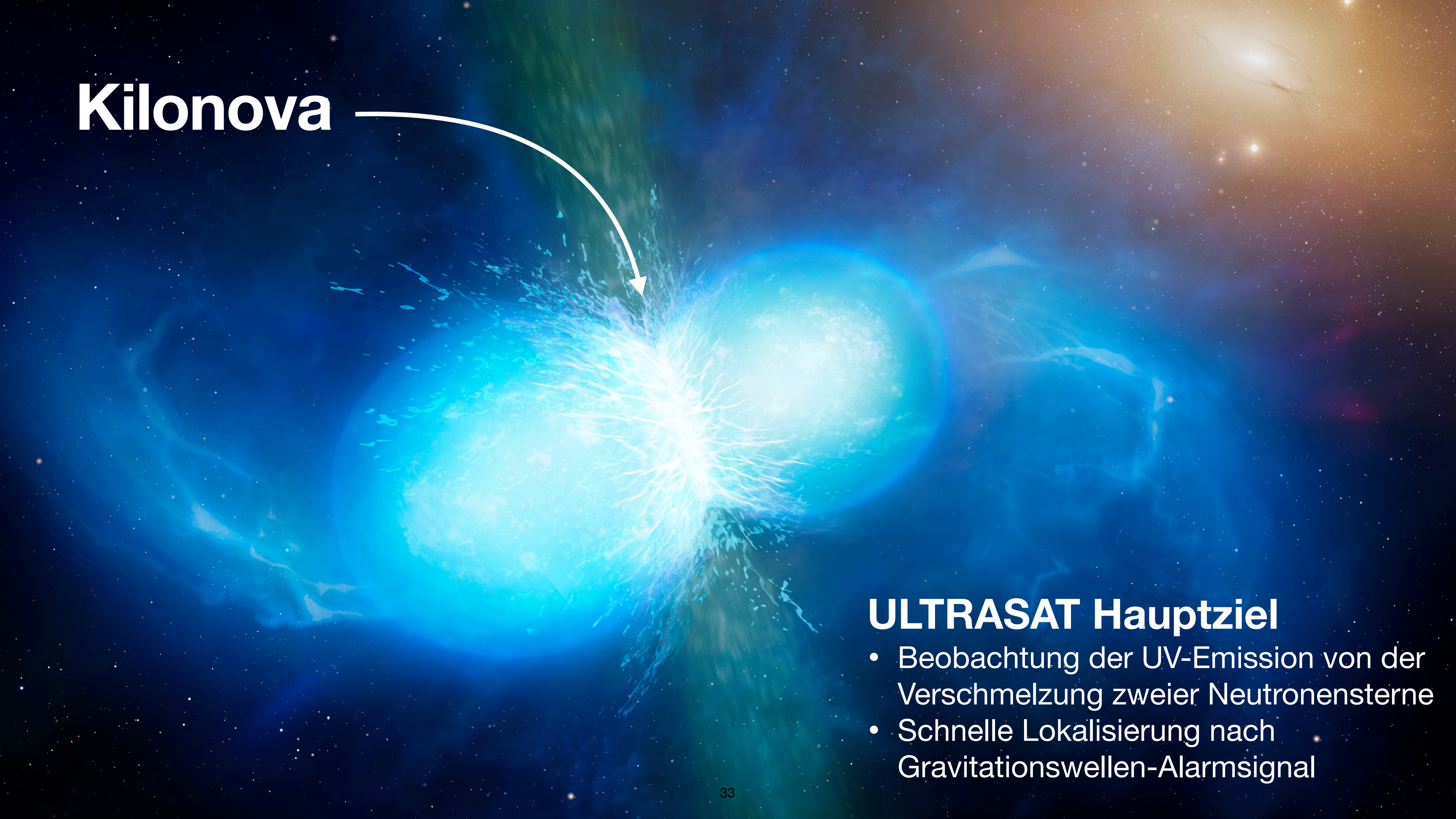
- Transient und einmalig
- z.B. Kollaps eines Sterns zum Ende seiner Lebenszeit
- ULTRASAT Hauptziel 2

Kilonova

- Transient und einmalig
- Verschmelzung zweier Neutronensterne
- ULTRASAT Hauptziel 1



Kilonova

An artistic rendering of a kilonova event, showing two bright blue, glowing spheres (neutron stars) in the process of merging. A bright, star-like point of light is visible at the point of contact between the two spheres, with wispy, filamentary structures radiating outwards. A white curved arrow points from the word 'Kilonova' to this central point of impact. The background is a deep blue space filled with distant stars and a faint, glowing nebula in the upper right corner.

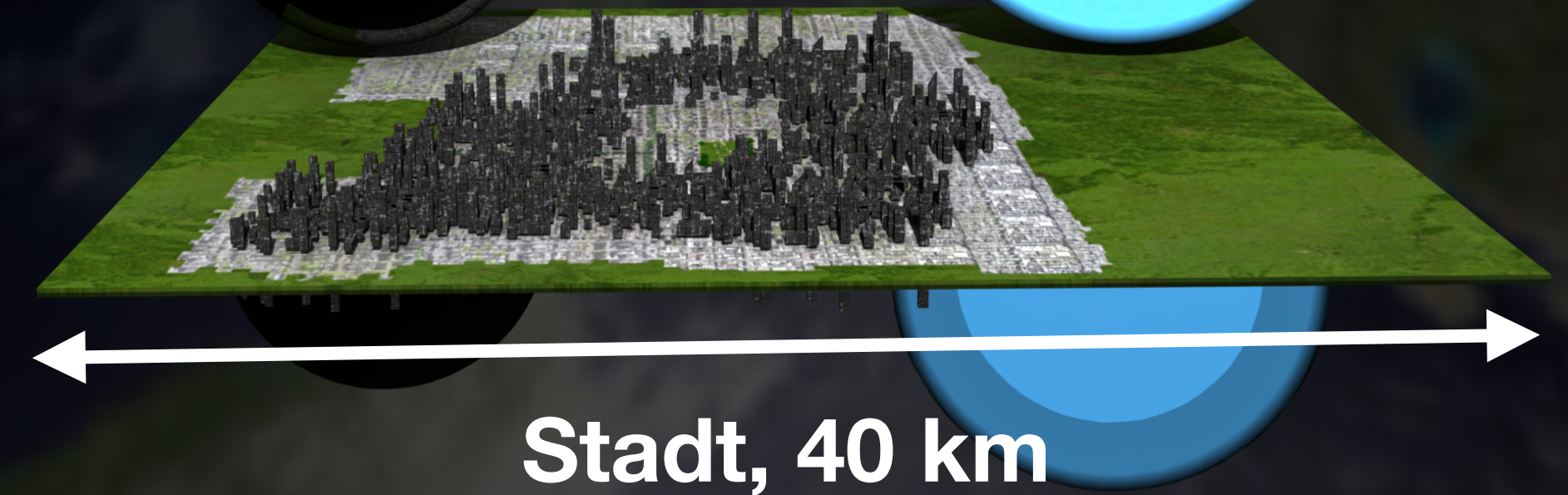
ULTRASAT Hauptziel

- Beobachtung der UV-Emission von der Verschmelzung zweier Neutronensterne
- Schnelle Lokalisierung nach Gravitationswellen-Alarmsignal

Kilonova

Neutronensterne sind sehr
schwer und kompakt

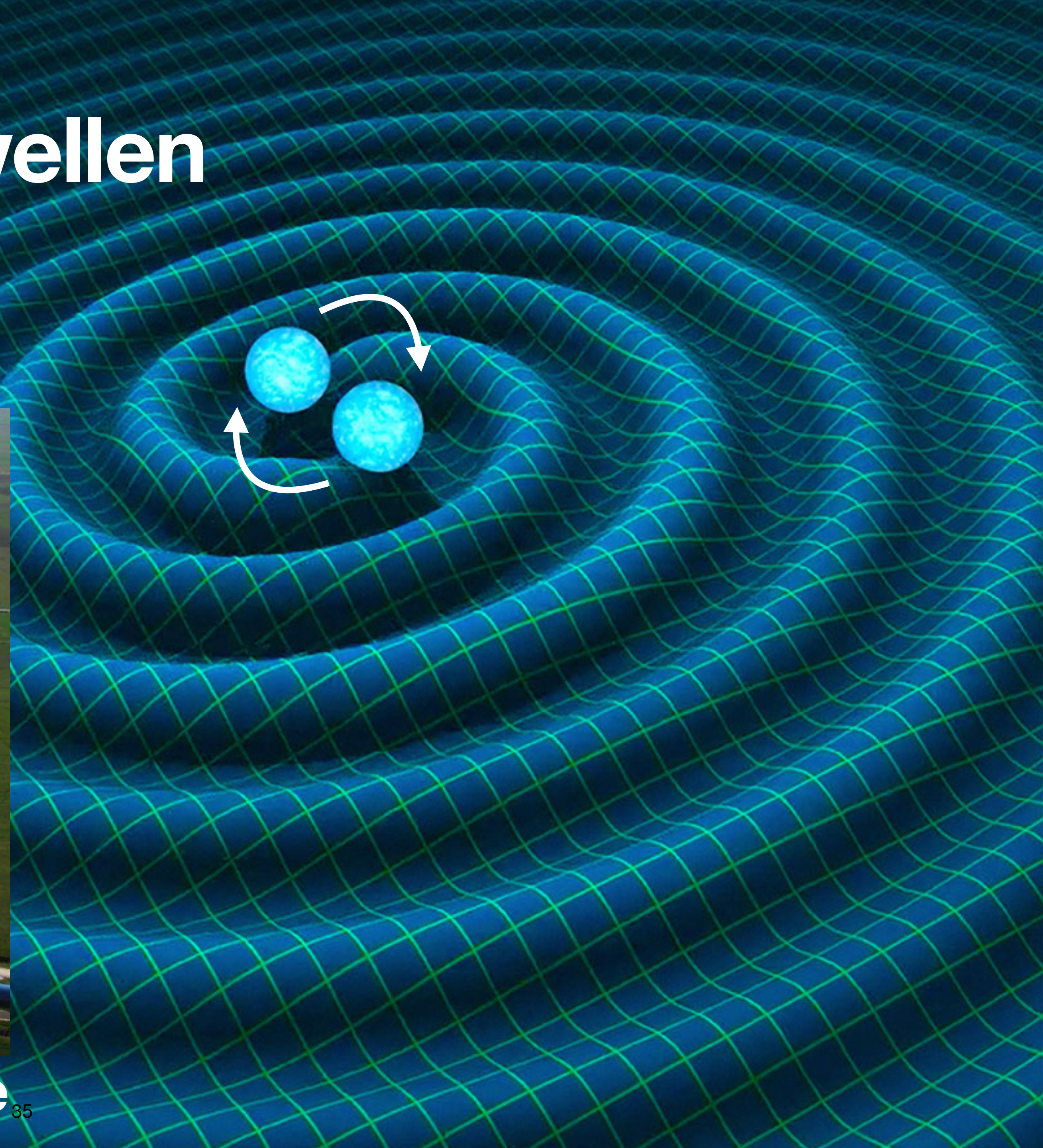
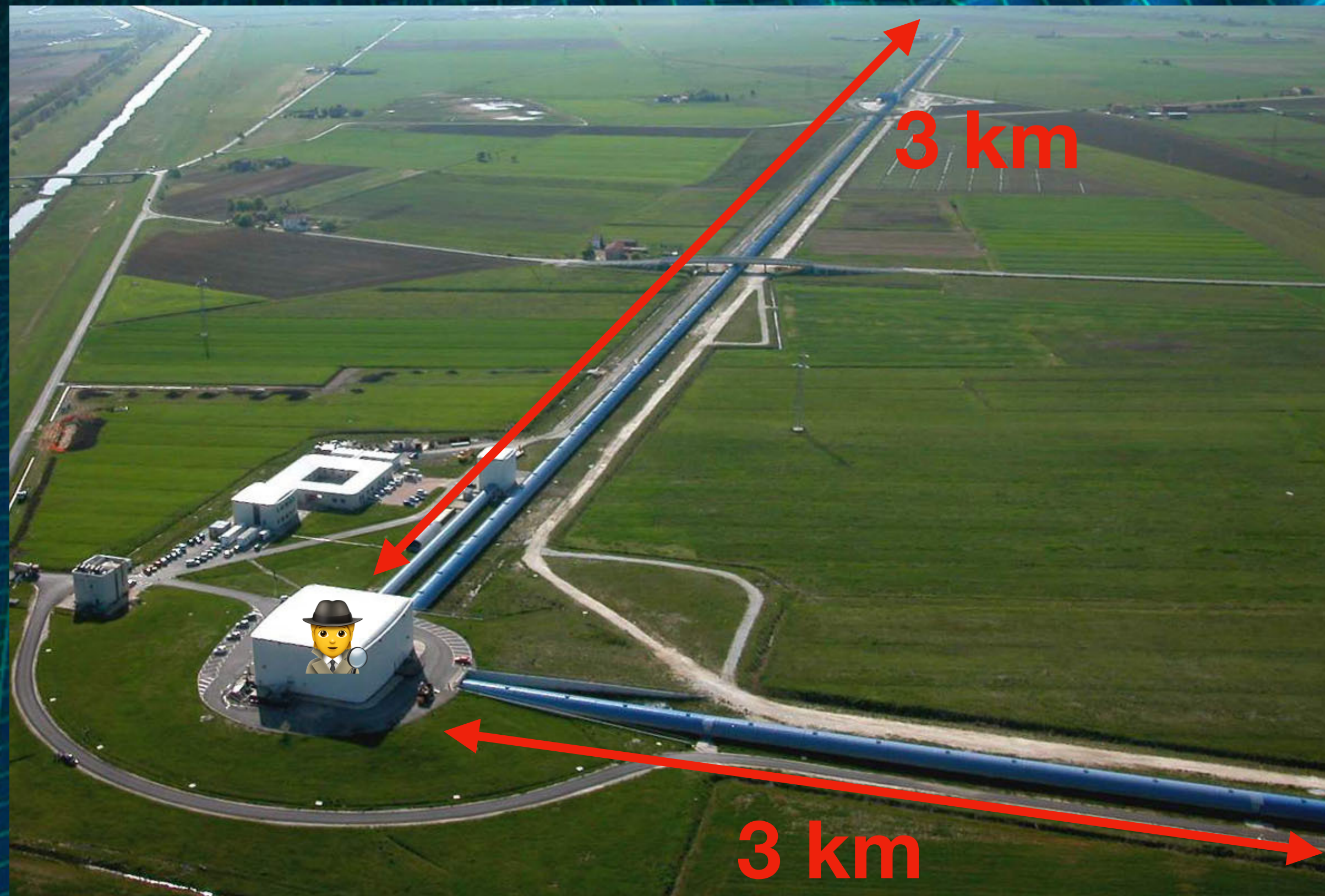
1 Sonnen-
masse



ULTRASAT Hauptziel

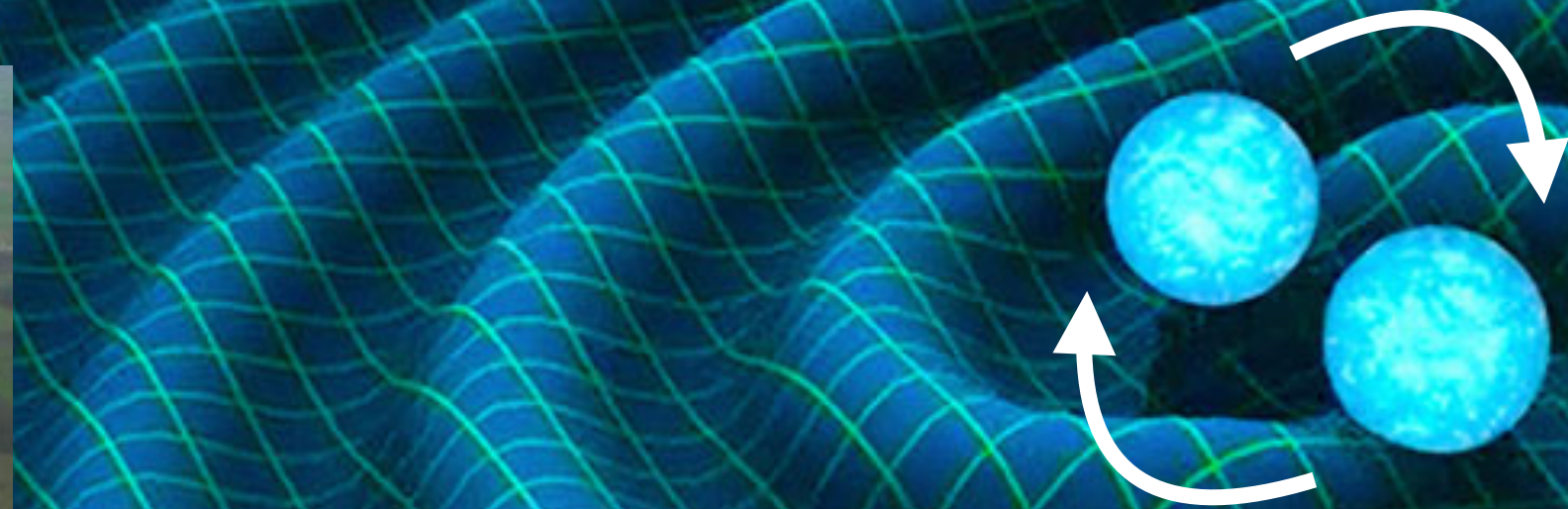
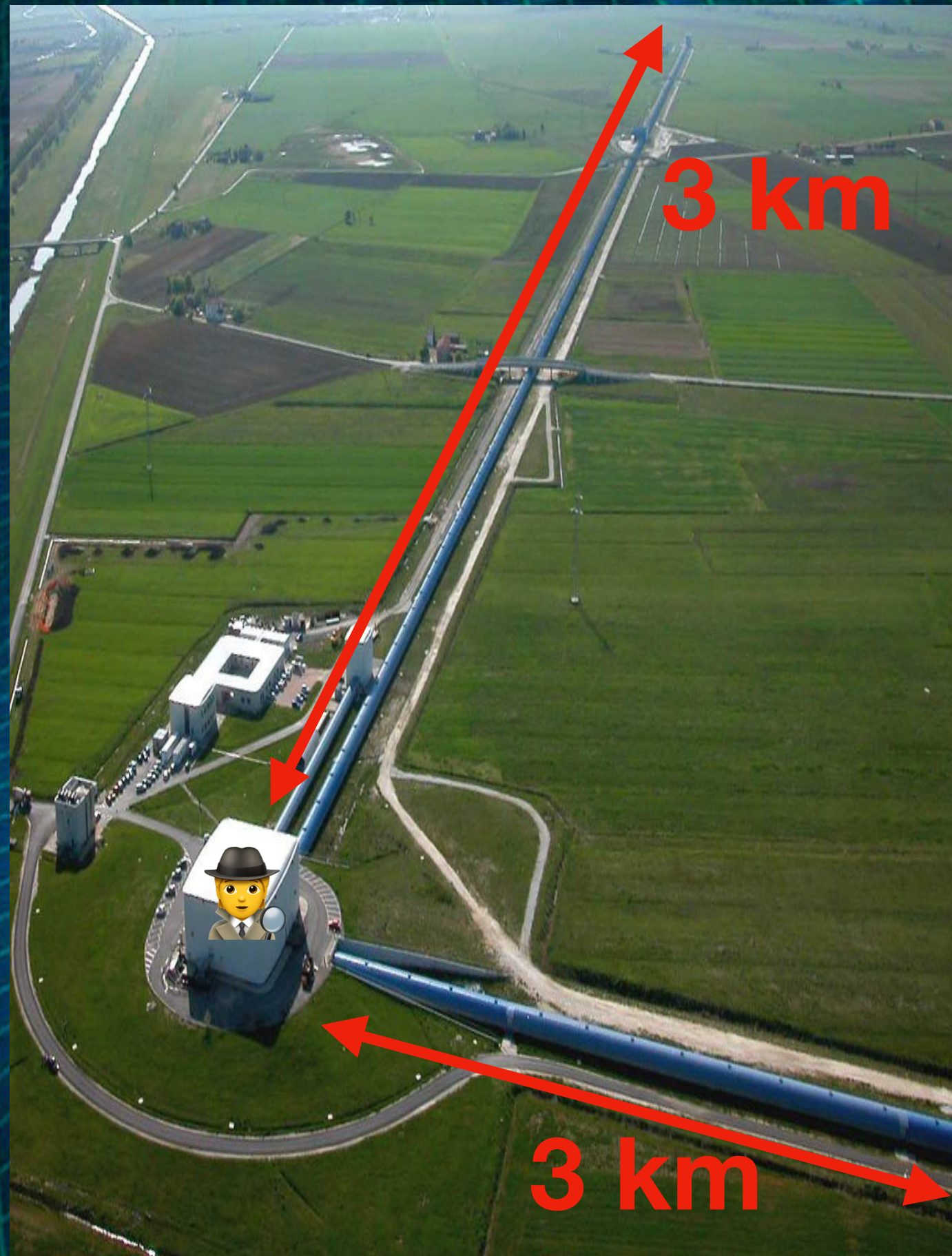
- Beobachtung der UV-Emission von der Verschmelzung zweier Neutronensterne
- Schnelle Lokalisierung nach Gravitationswellen-Alarmsignal

Exkurs: Gravitationswellen



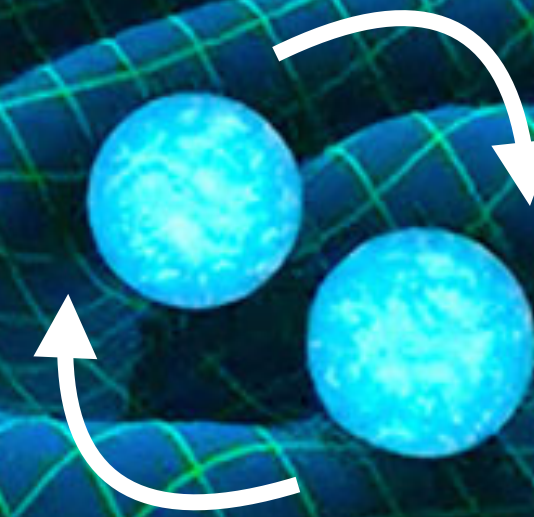
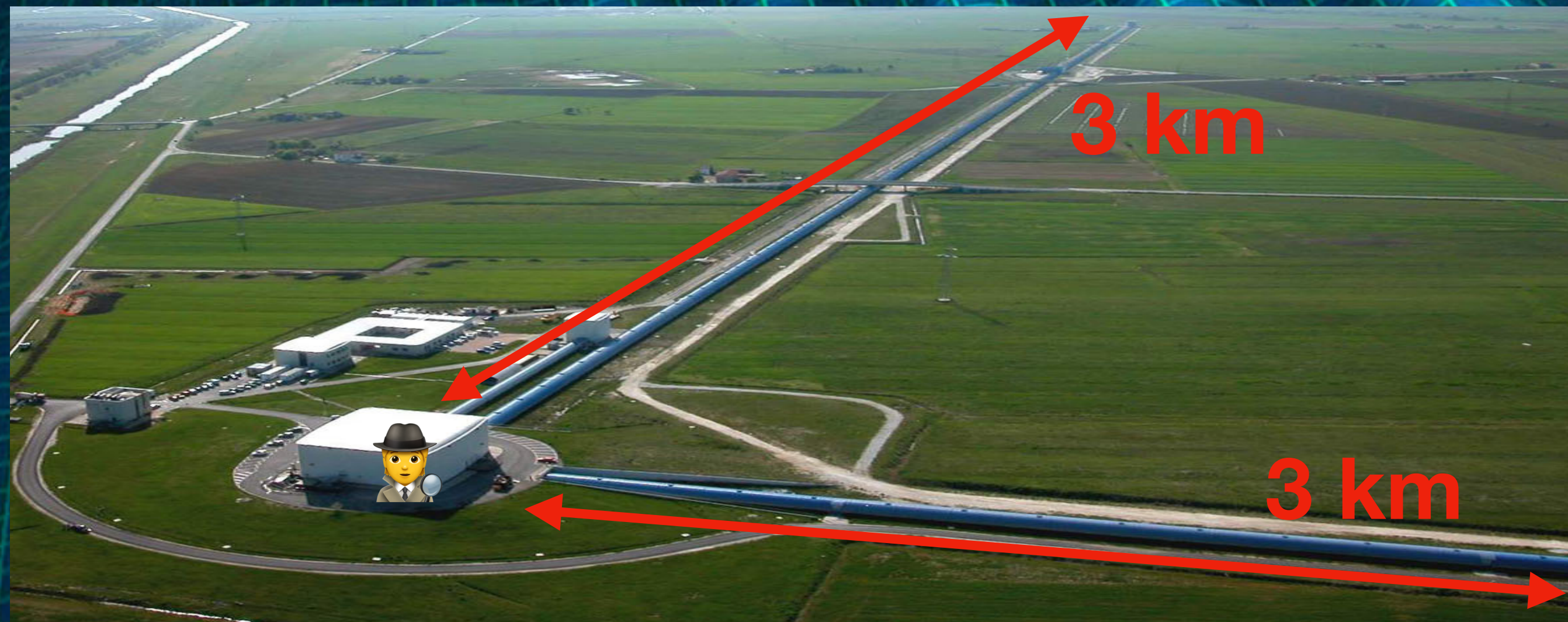
Gravitationswellen-Interferometrie

Exkurs: Gravitationswellen

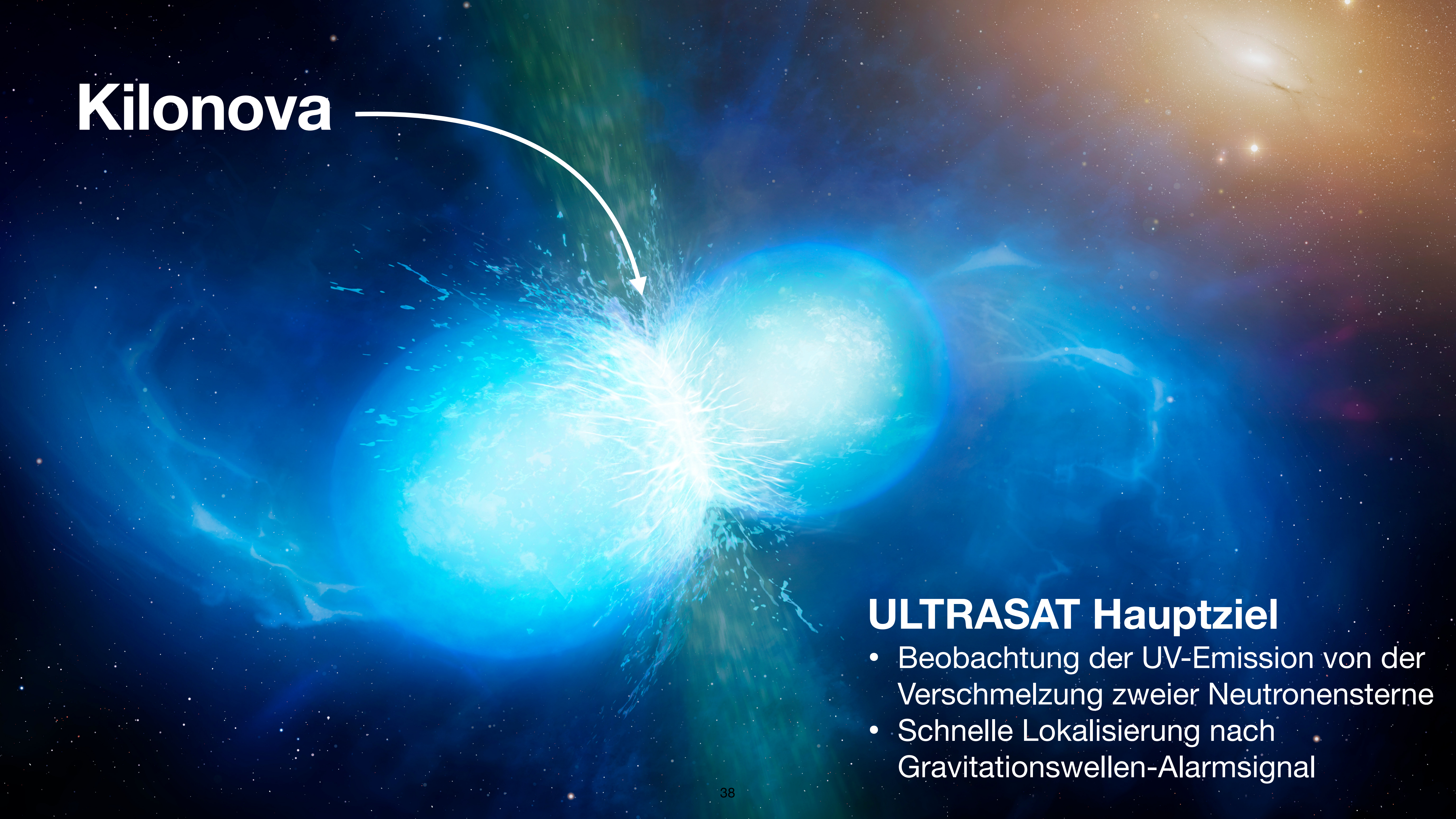


Gravitationswellen-Interferometrie

Exkurs: Gravitationswellen



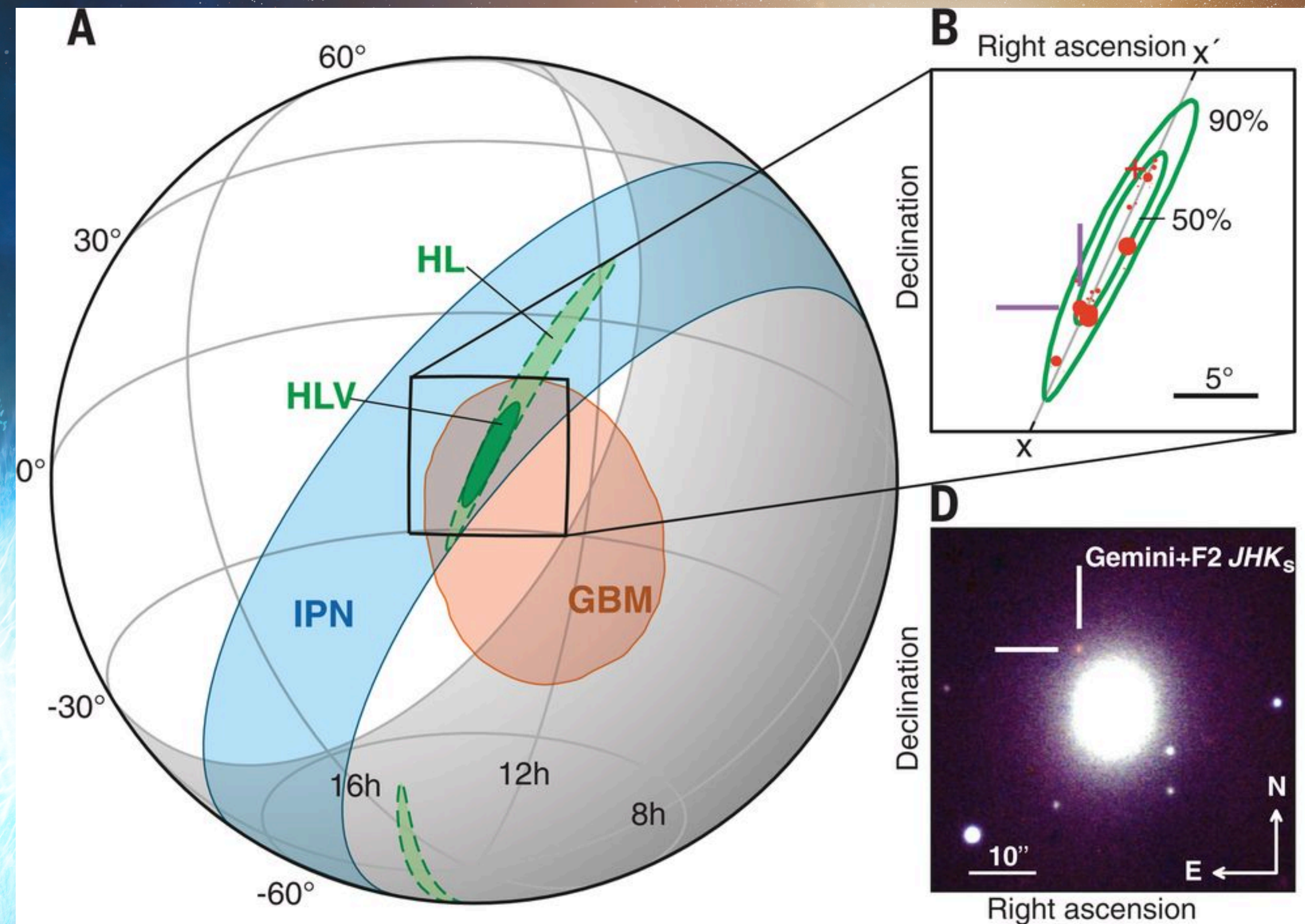
Kilonova

An artistic rendering of a kilonova event, showing two bright blue, glowing spheres (neutron stars) in the process of merging. A bright, star-like point of light is visible at the point of contact between the two spheres, with wispy, filamentary structures of glowing blue and white material emanating from the center. A white curved arrow originates from the word 'Kilonova' and points towards this central point of impact. The background is a deep blue space filled with distant stars and a faint, glowing nebula in the upper right corner.

ULTRASAT Hauptziel

- Beobachtung der UV-Emission von der Verschmelzung zweier Neutronensterne
- Schnelle Lokalisierung nach Gravitationswellen-Alarmsignal

Kilonova

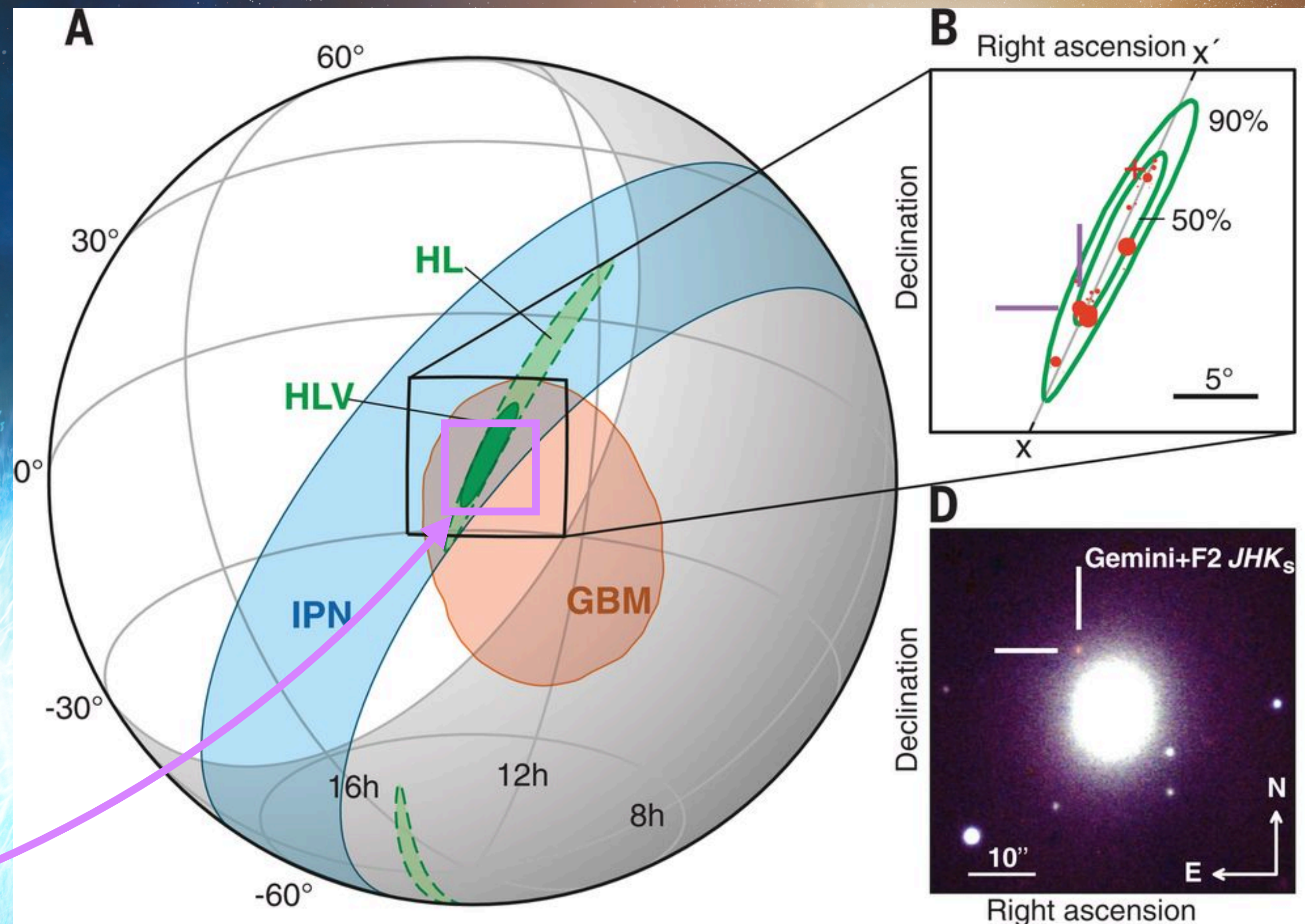


**Genaue Lokalisation nur durch
weiter Instrumente möglich**

ULTRASAT Hauptziel

- Beobachtung der UV-Emission von der Verschmelzung zweier Neutronensterne
- Schnelle Lokalisierung nach Gravitationswellen-Alarmsignal

Kilonova



ULTRASAT Blickfeld !

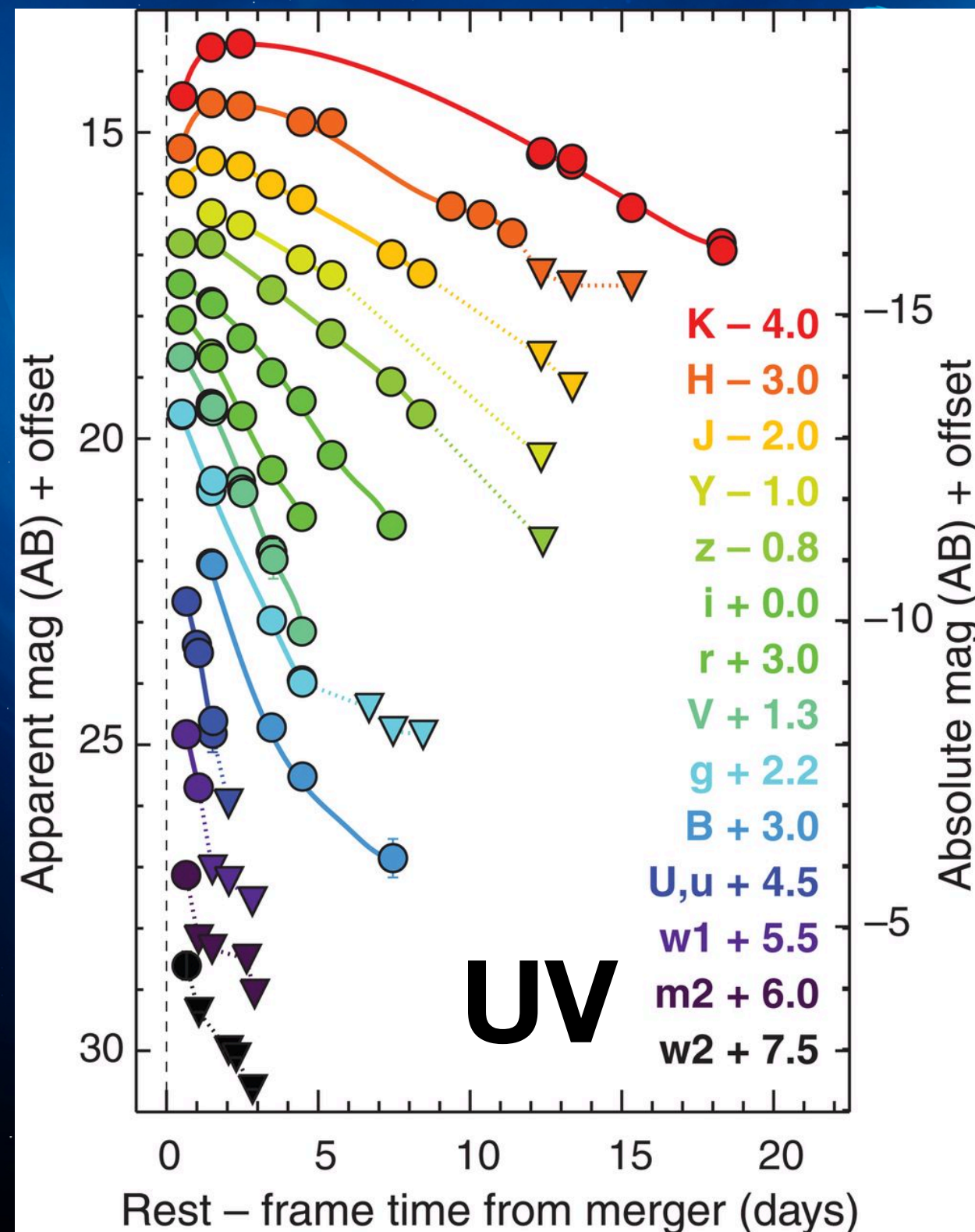
Genaue Lokalisation nur durch weiter Instrumente möglich

ULTRASAT Hauptziel

- Beobachtung der UV-Emission von der Verschmelzung zweier Neutronensterne
- Schnelle Lokalisierung nach Gravitationswellen-Alarmsignal

Kilonova

Multi-Wellenlängen Lichtkurve



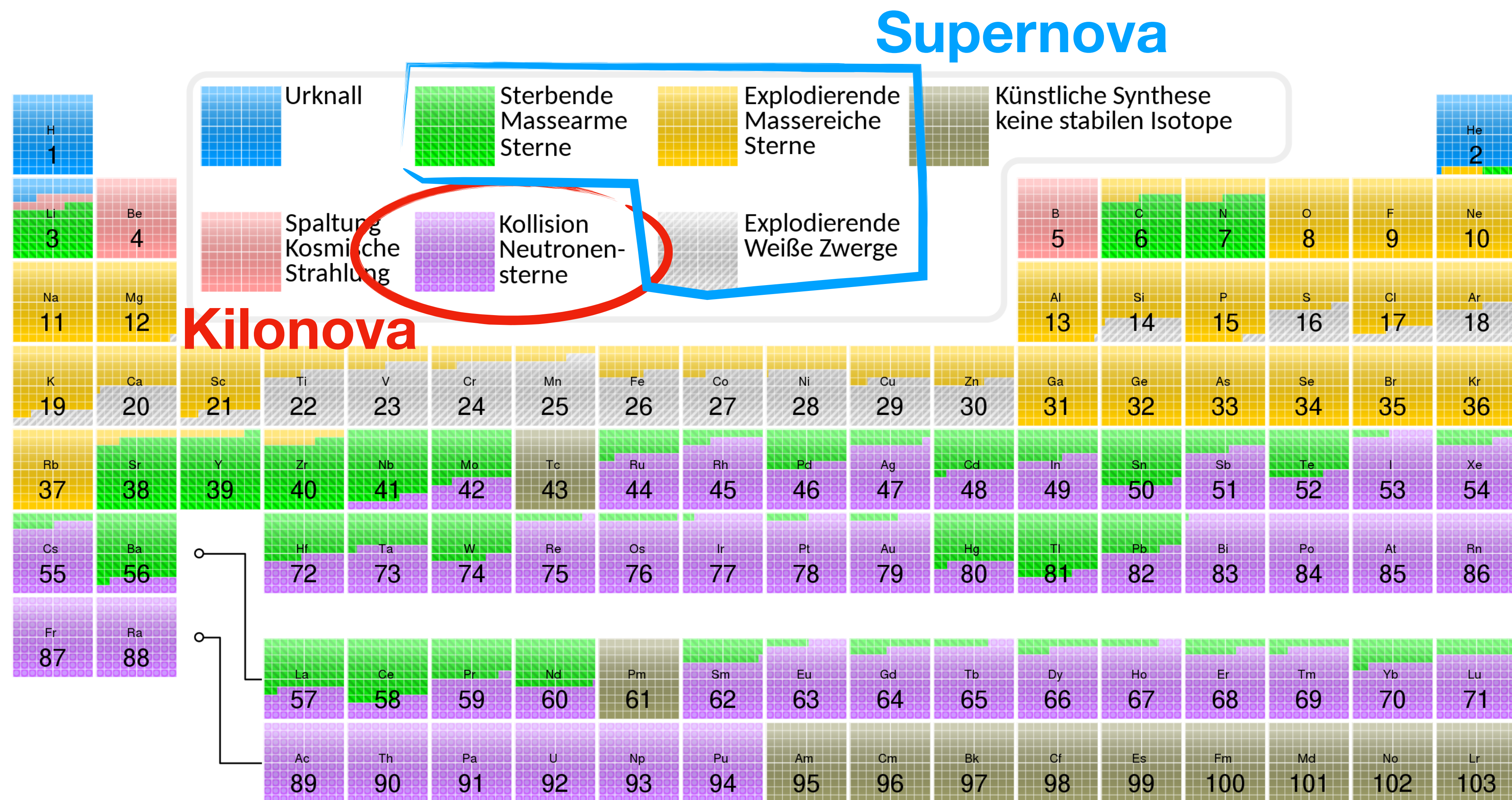
Helligkeit 💡👉

Zeit ⌚👉

ULTRASAT Hauptziel

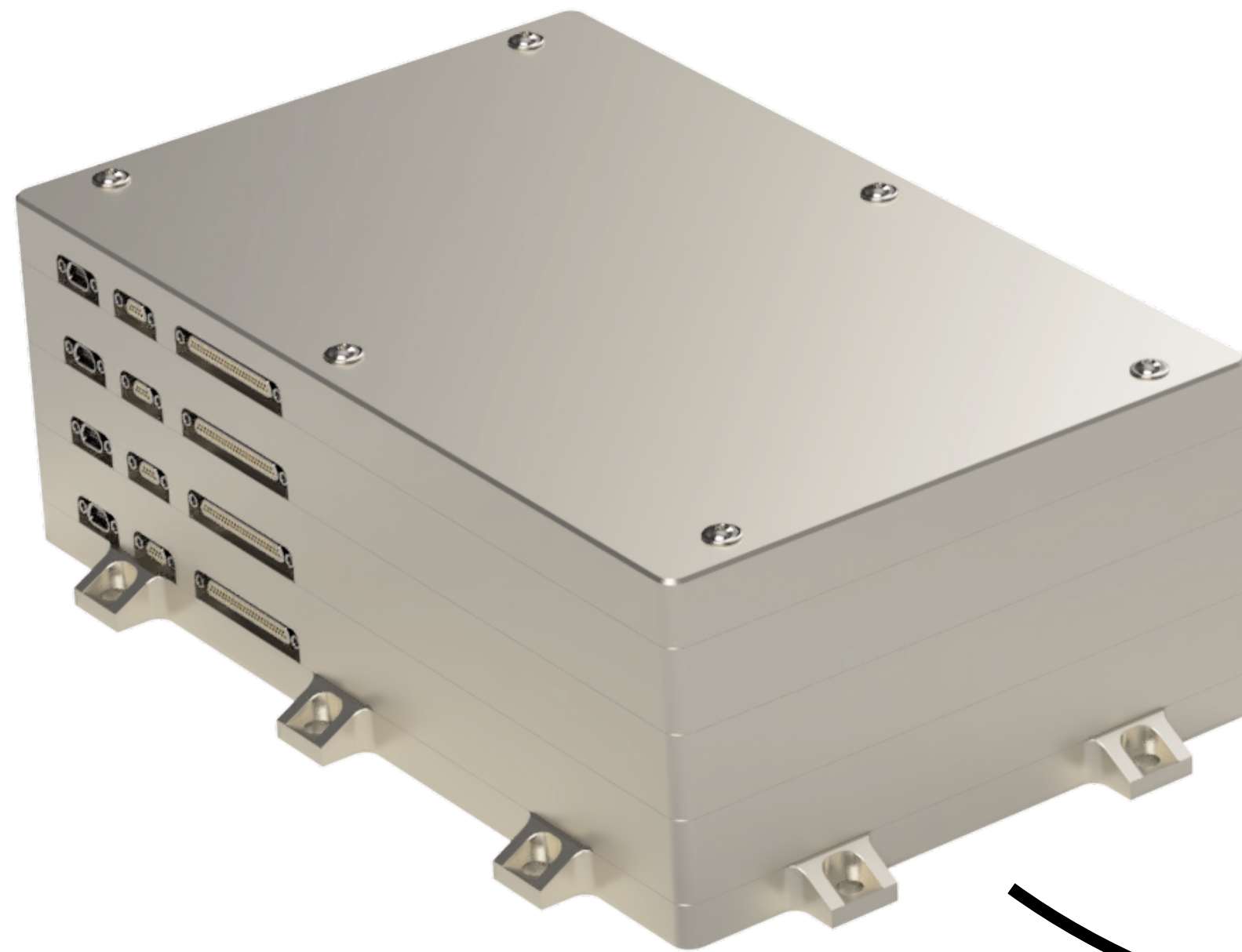
- Beobachtung der UV-Emission von der Verschmelzung zweier Neutronensterne
- Schnelle Lokalisierung nach Gravitationswellen-Alarmsignal

Entstehung der Elemente

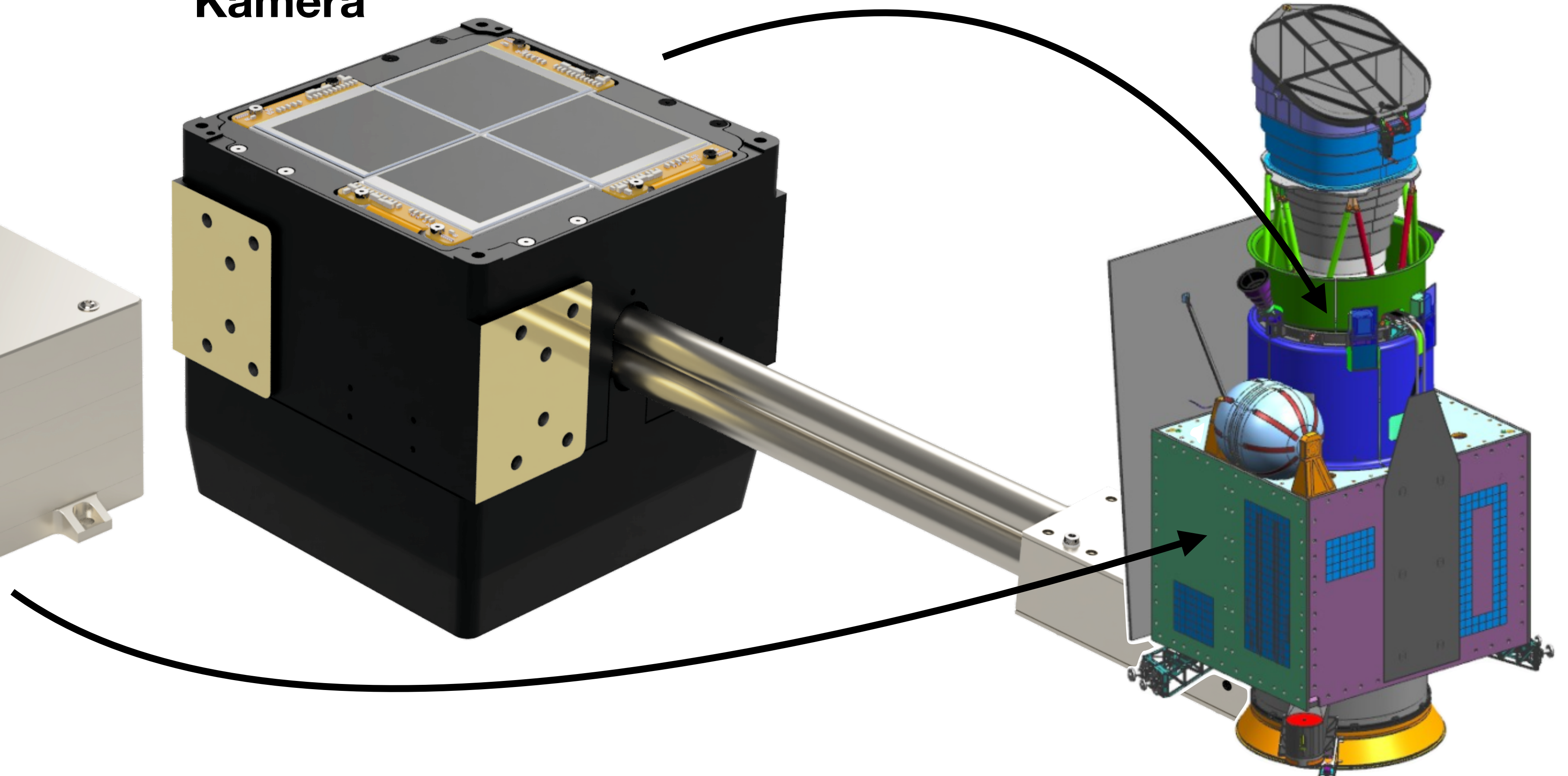
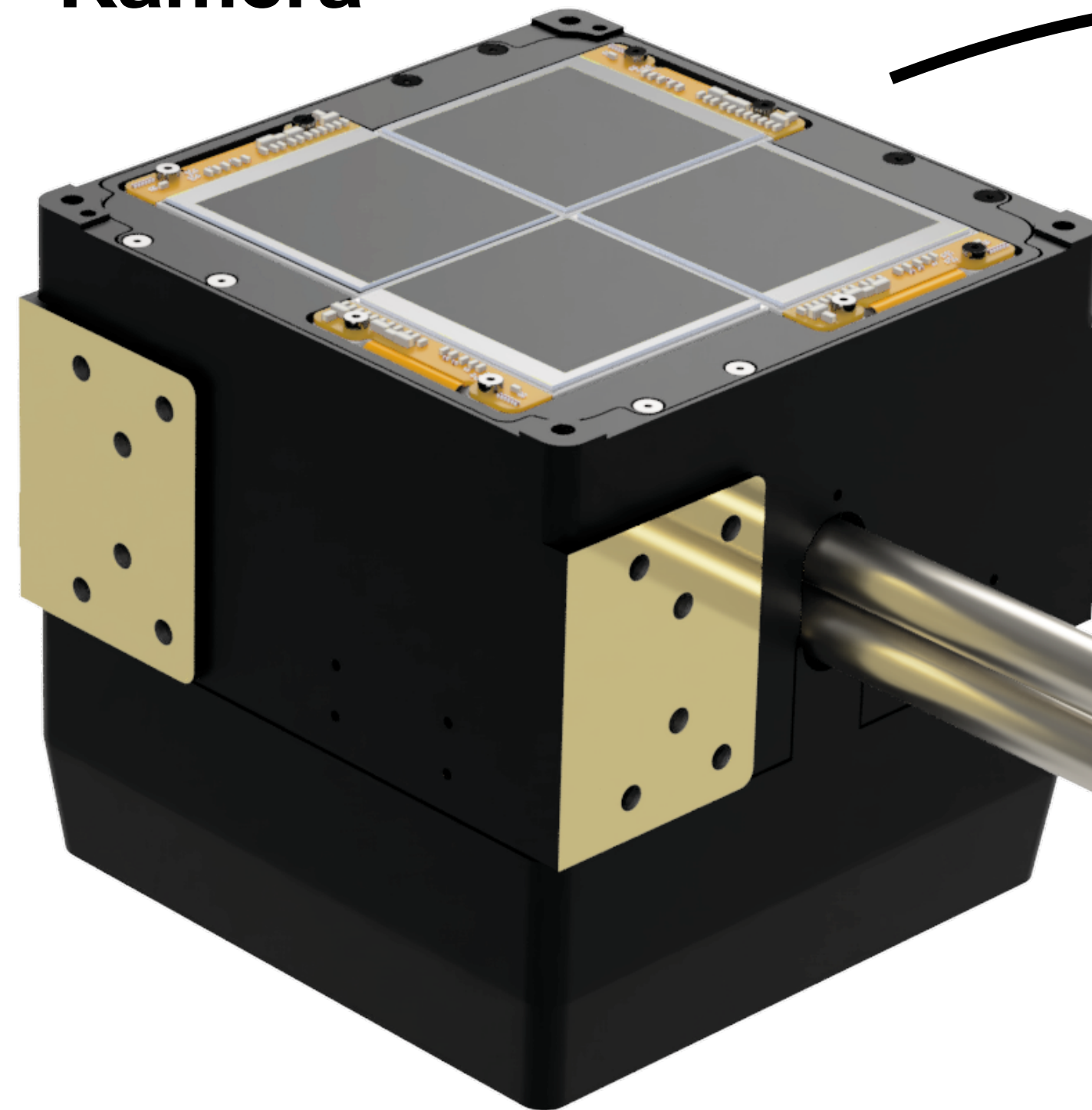


ULTRASAT Kamera Entwicklung @DESY

Steuerungselektronik



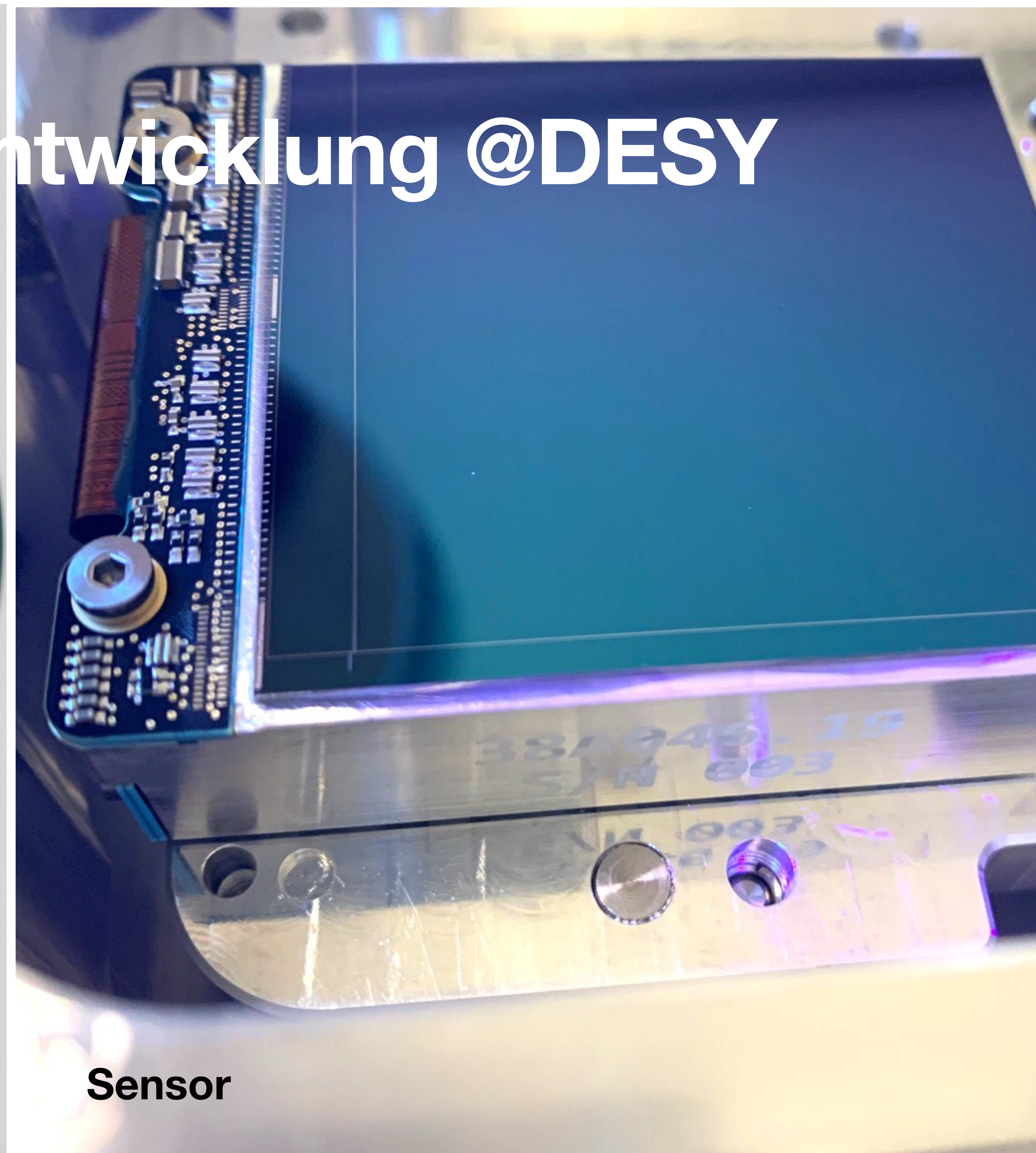
Kamera



ULTRASAT Kamera Entwicklung @DESY

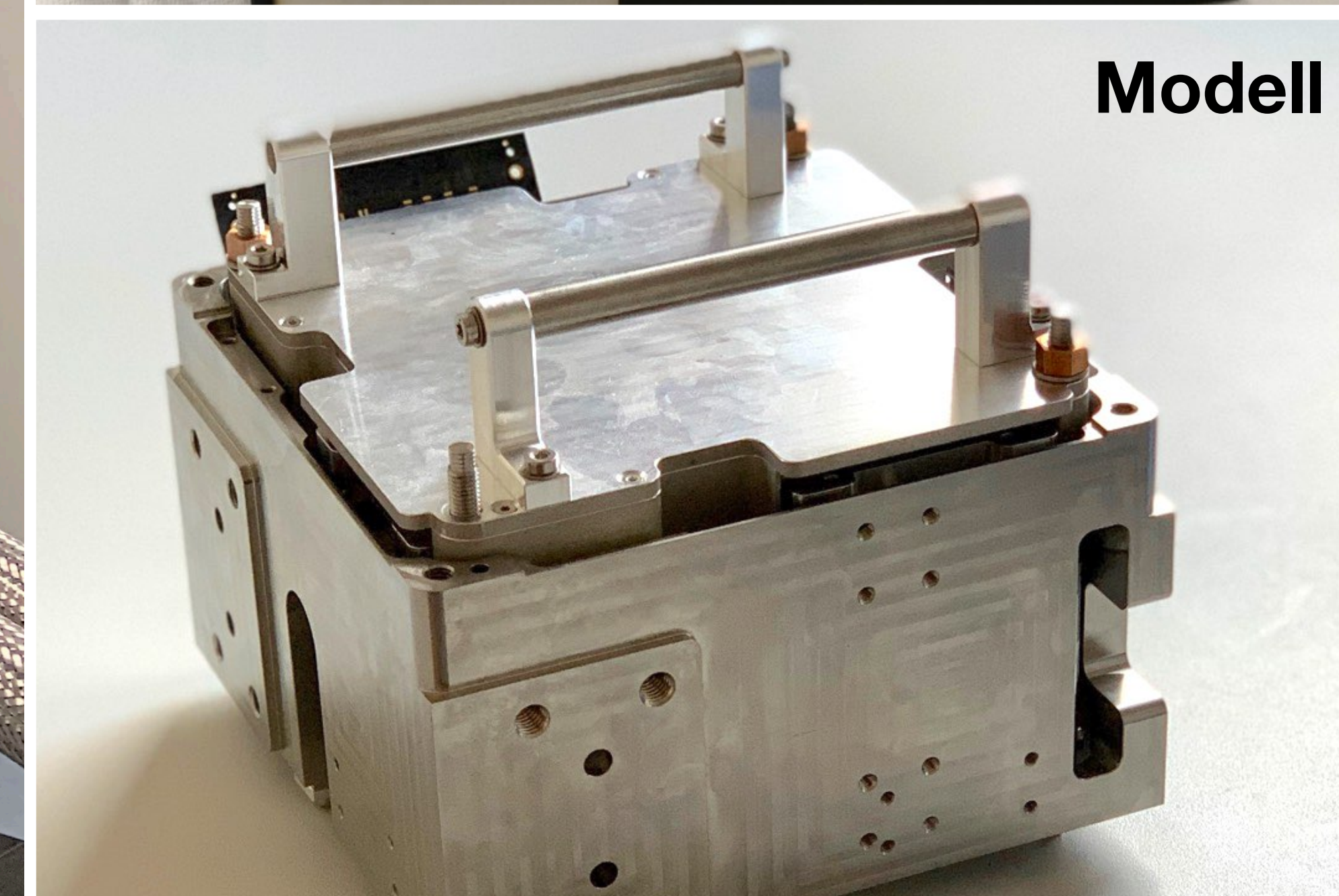
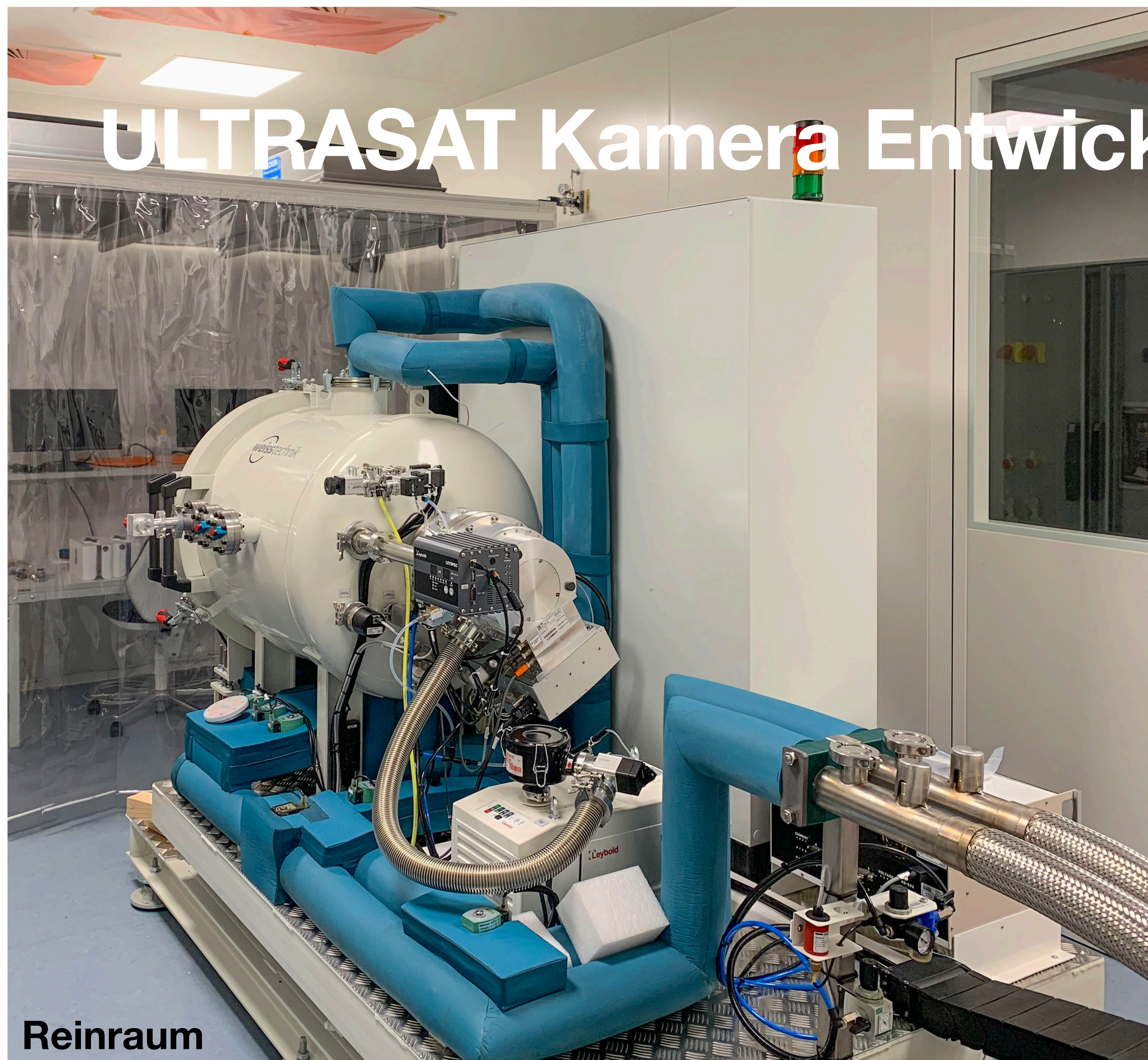


Wafer

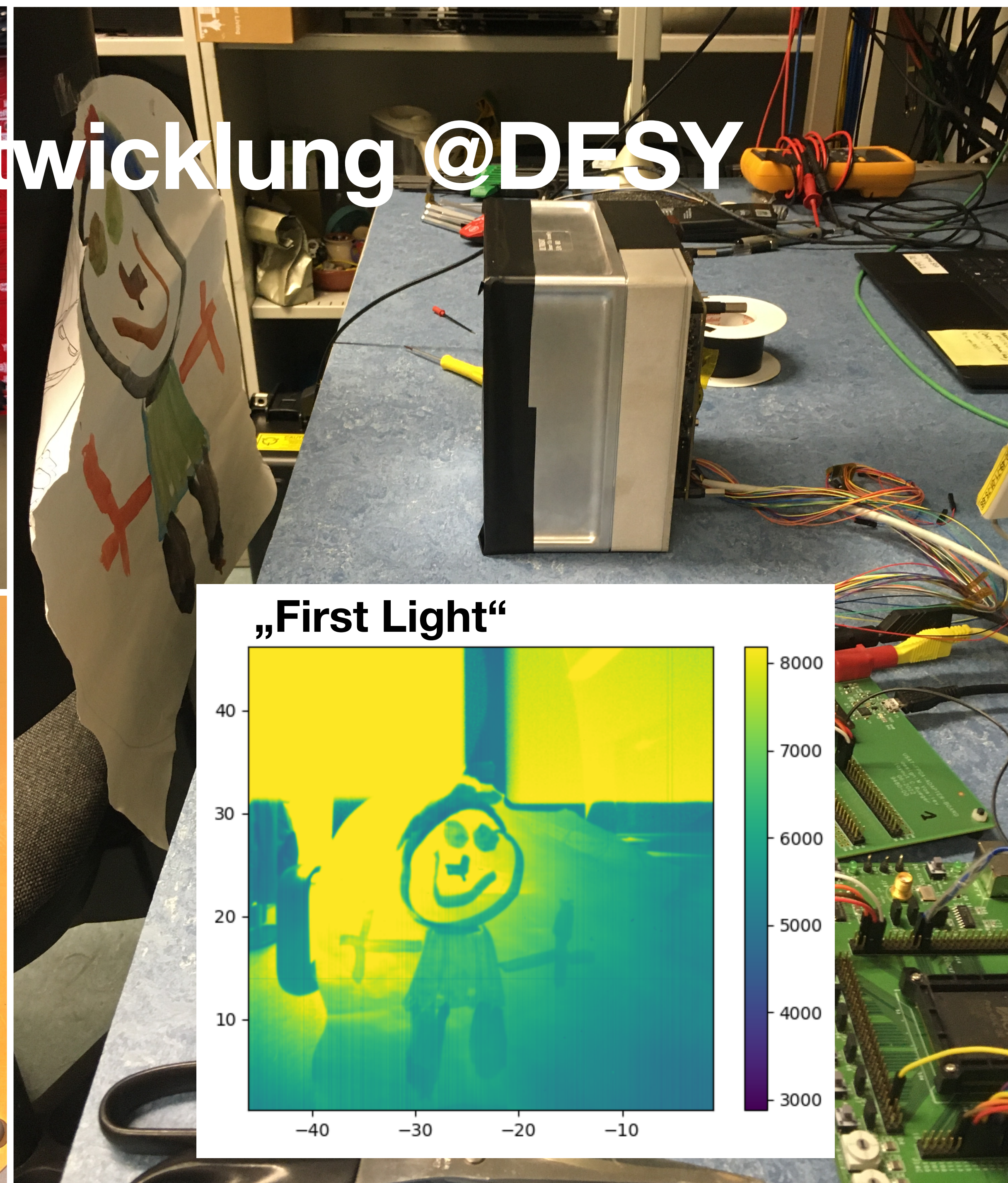
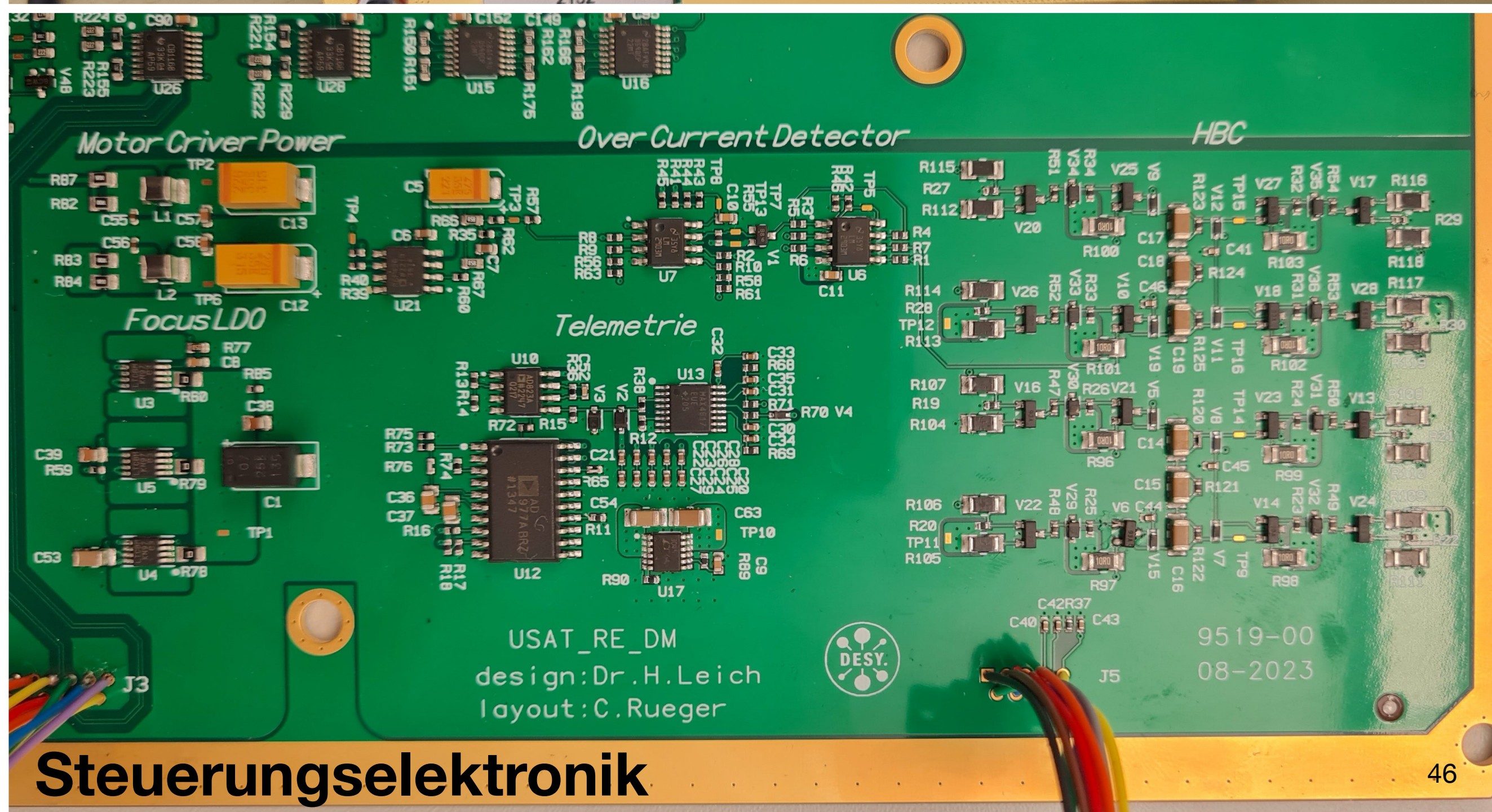
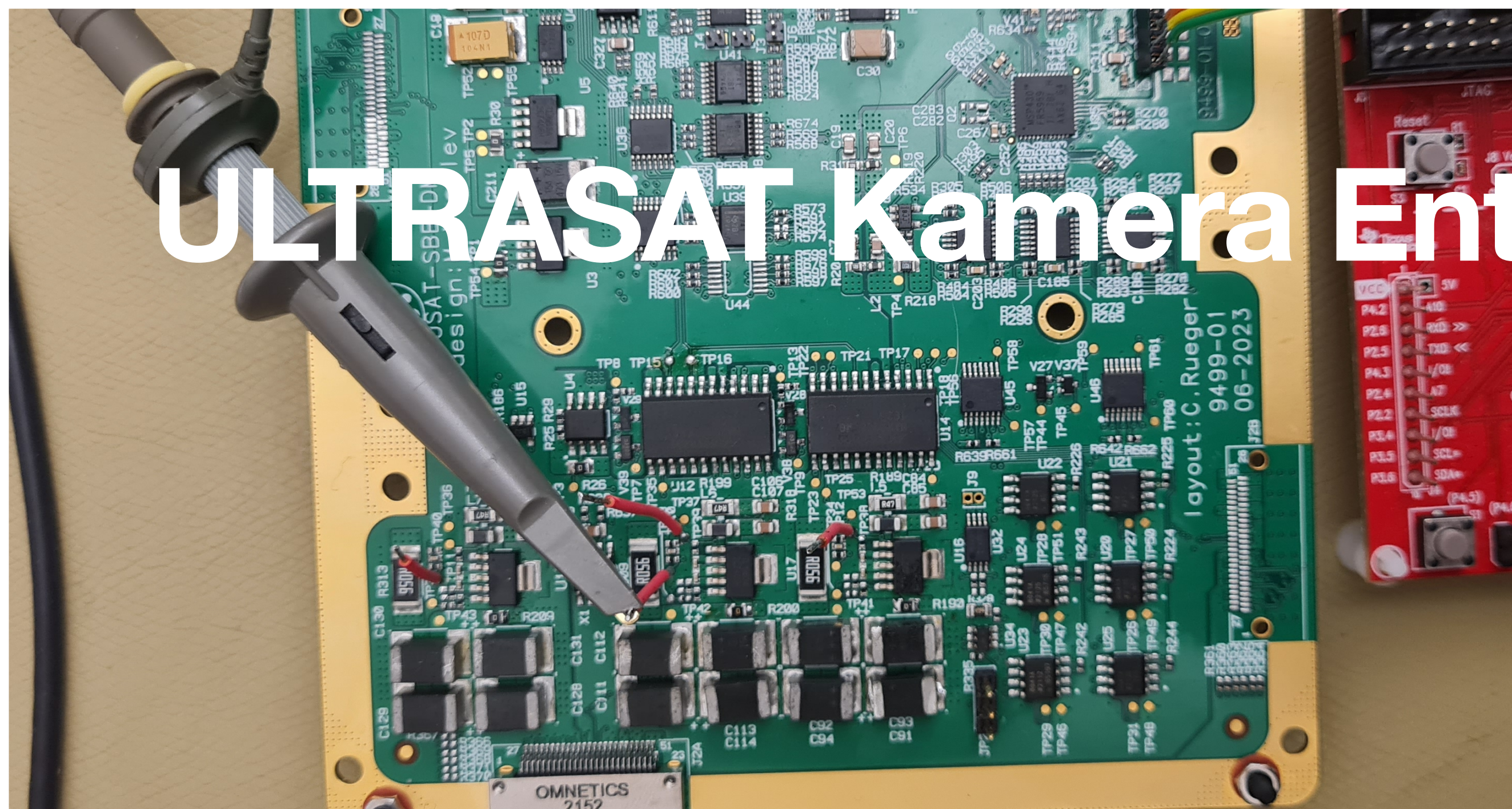


Sensor

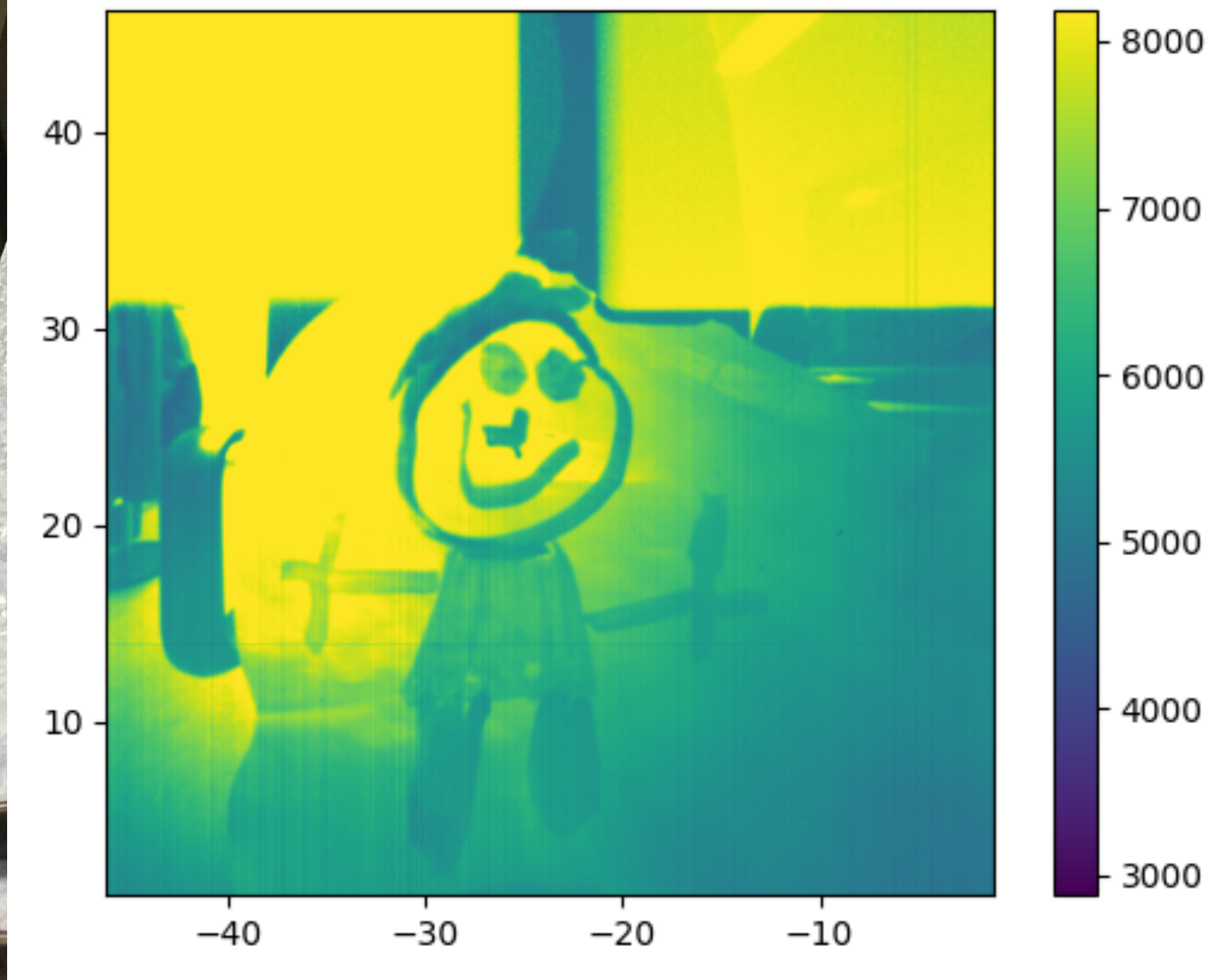
ULTRASAT Kamera Entwicklung @DESY



ULTRASAT Kamera Entwicklung @DESY

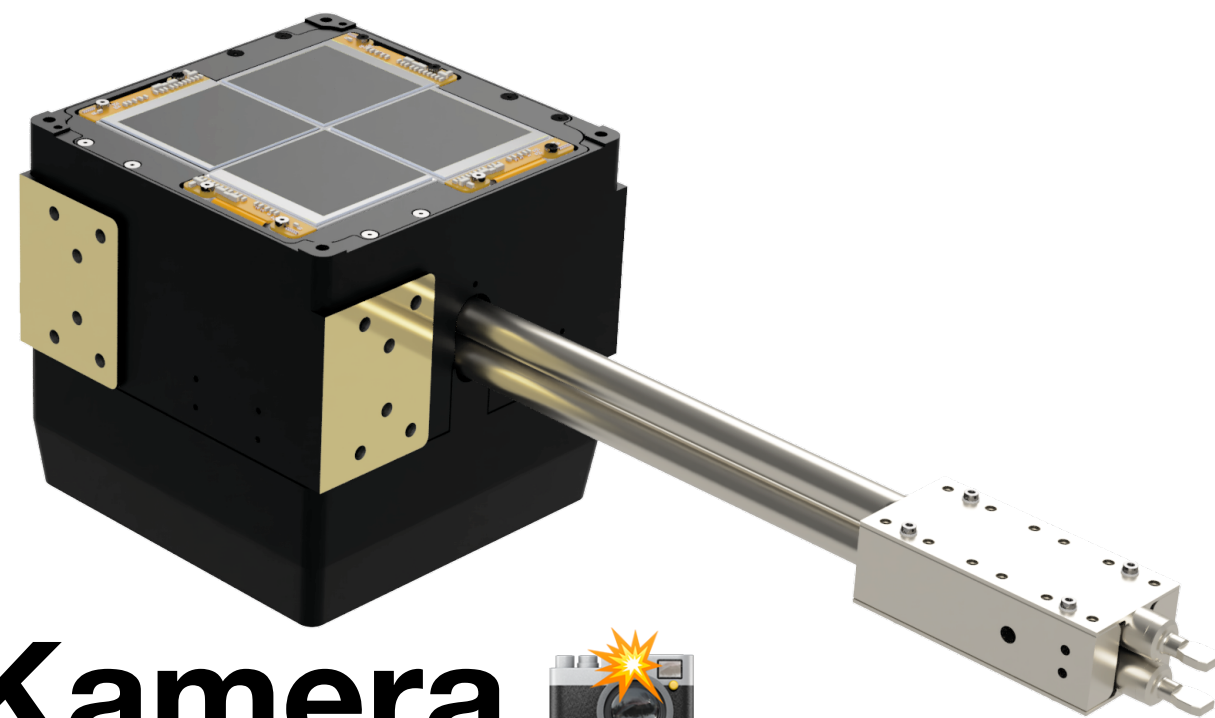


„First Light“



ULTRASAT Zeitplan

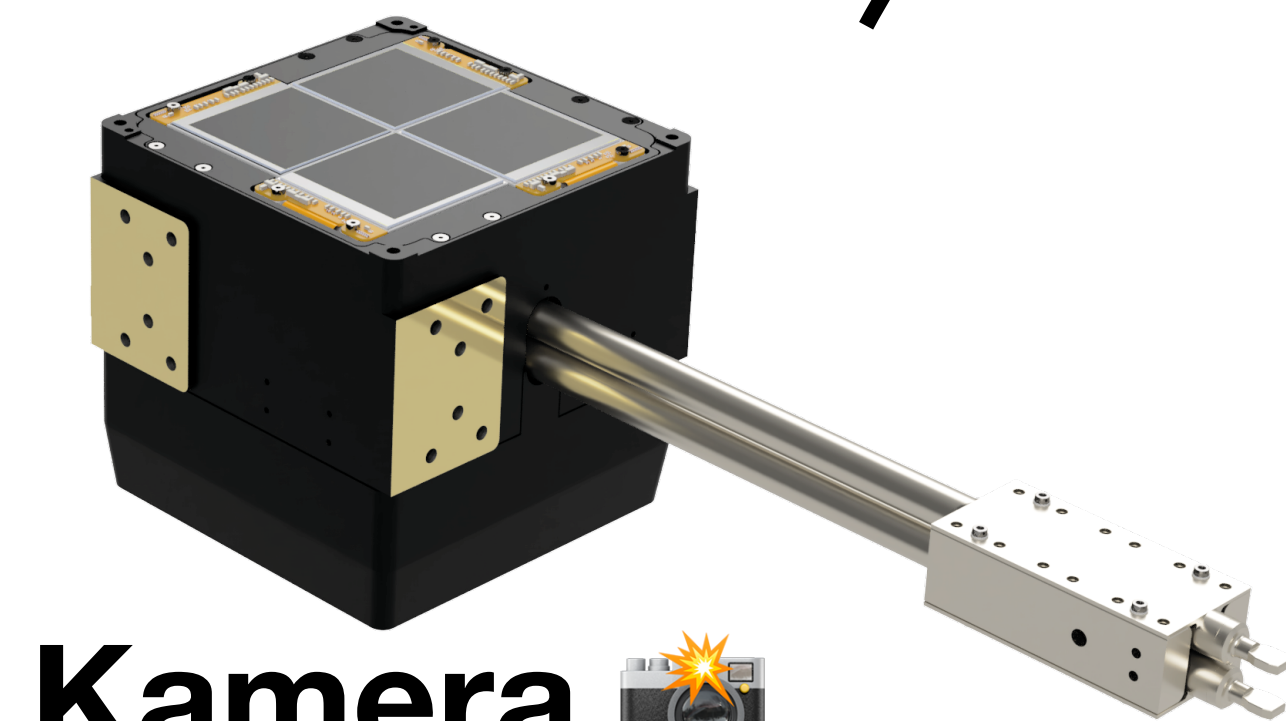
Projektstart
2019



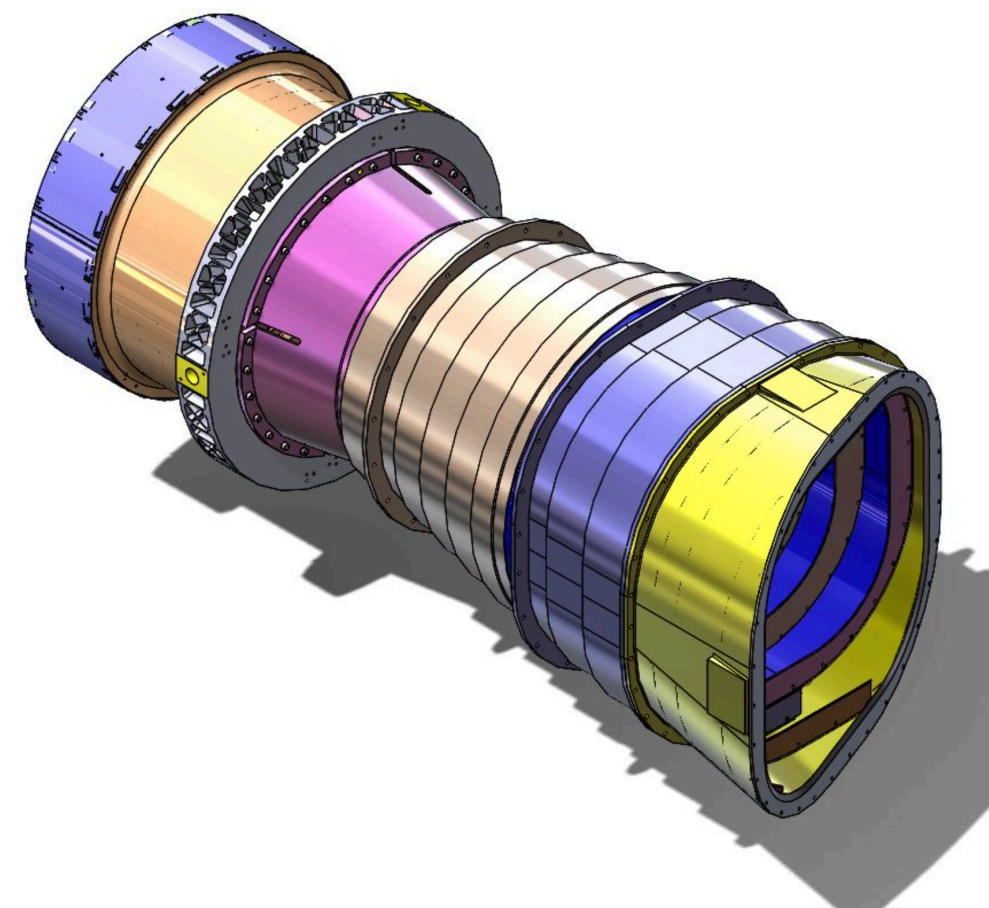
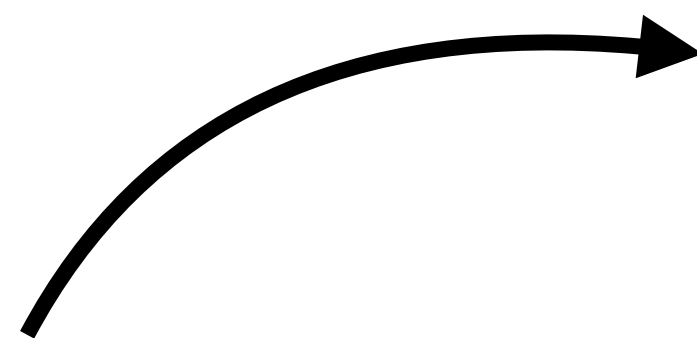
Kamera 
2026

ULTRASAT Zeitplan

Projektstart
2019



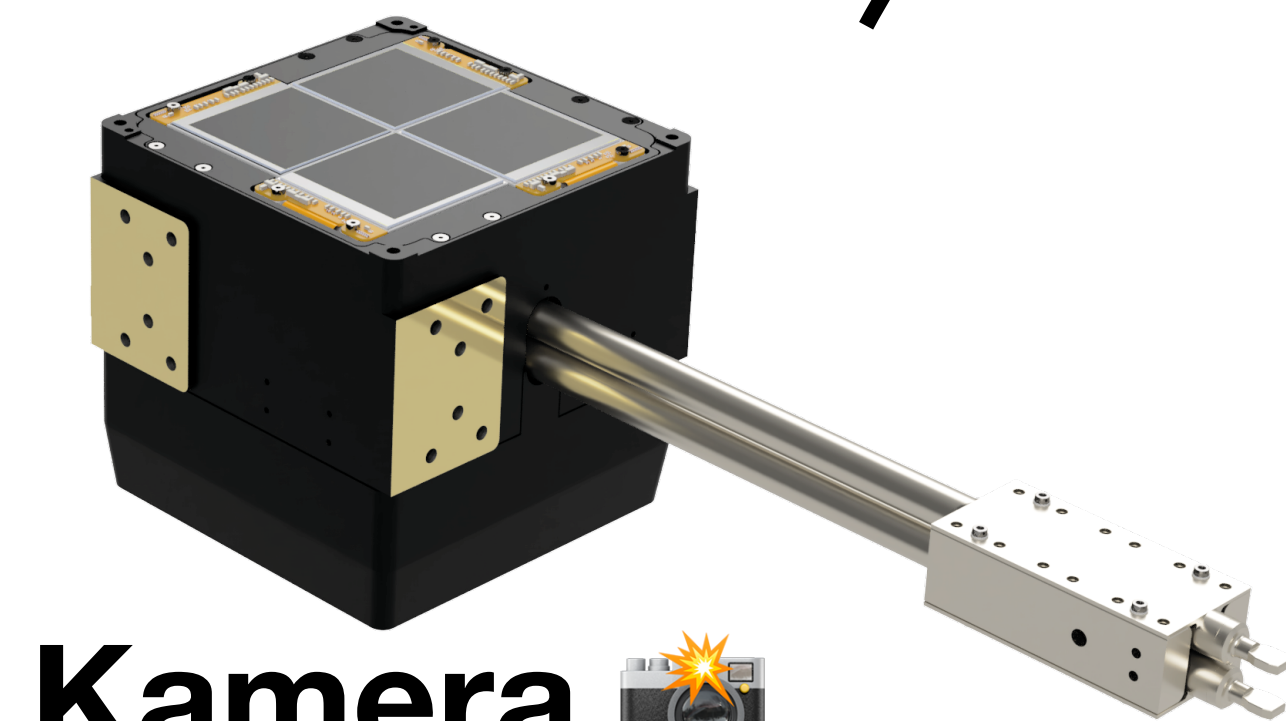
Kamera 📷
2026



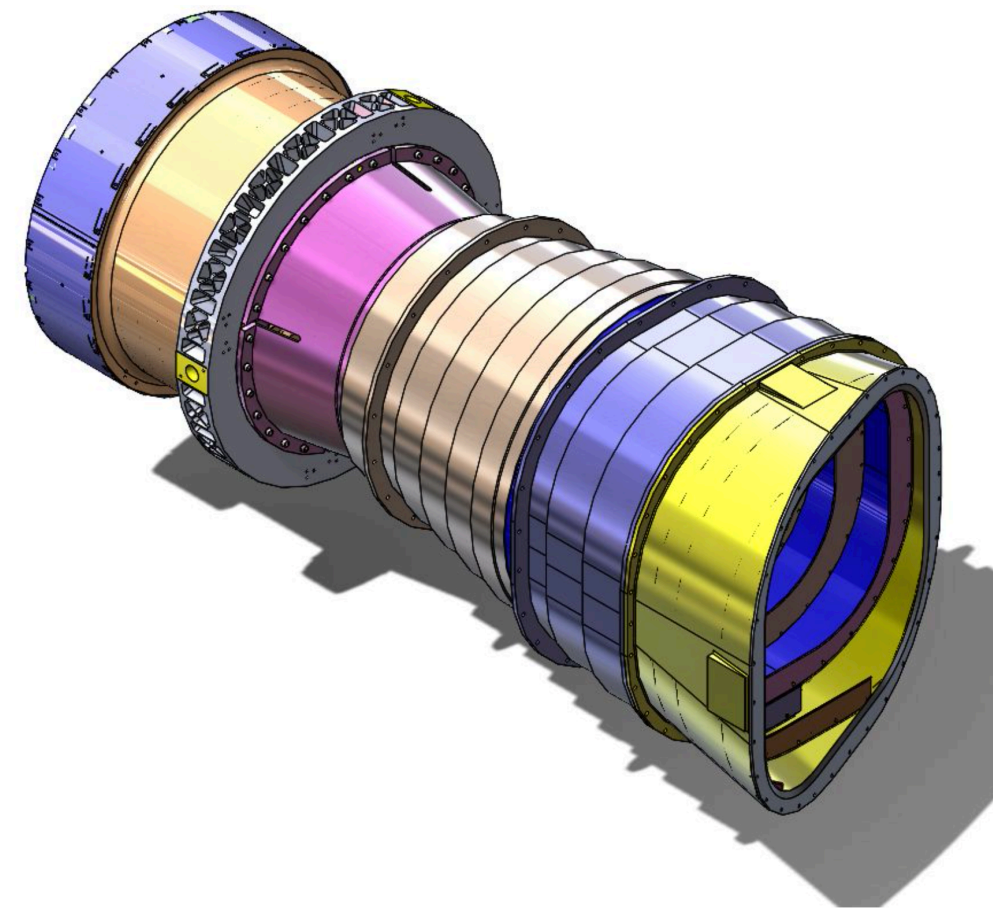
Teleskop 📡
2027

ULTRASAT Zeitplan

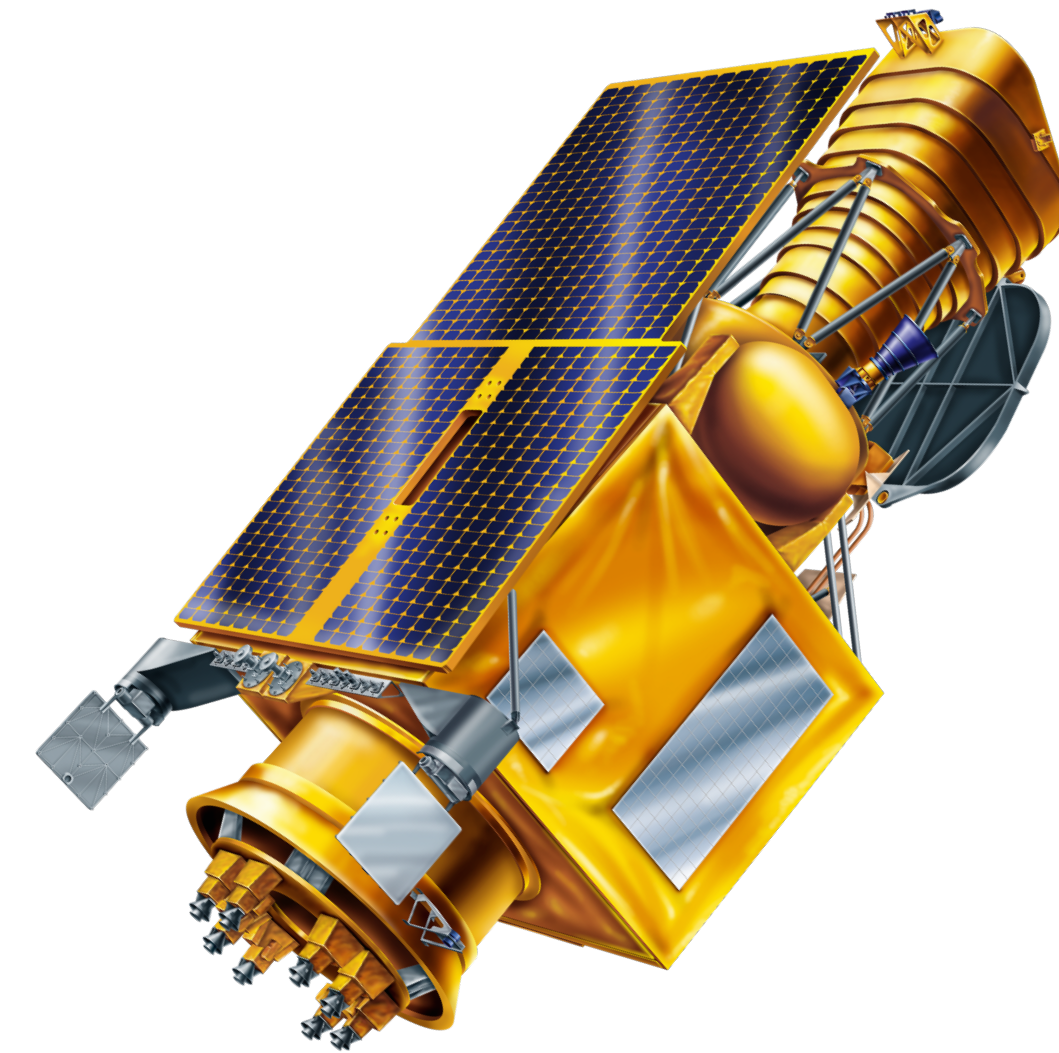
Projektstart
2019



Kamera 📷
2026



Teleskop 🔭
2027



Satellit & Raketenstart 🚀
2028



ULtraviolet► Heiße Objekte
TRansient►
Astronomy►
SATellite►



ULtraviolet▶ Heiße Objekte
TRansient▶ Kurzlebige Ereignisse
Astronomy▶
SATellite▶



UL traviolet	▶ Heiße Objekte
TR ansient	▶ Kurzlebige Ereignisse
A stronomy	▶ Gravitation & Elemente
SAT ellite	▶



UL traviolet	▶ Heiße Objekte
TR ansient	▶ Kurzlebige Ereignisse
A stronomy	▶ Gravitation & Elemente
SAT ellite	▶ Effiziente Mission