What are the models for emission of gamma rays, early optical, mid-optical, late radio/x-ray? What are the different models? What observations would convince you that your model is wrong?

Model	**Explains**	**Properties**	**Proven Wrong if**
Free Neutron Decay	Very early (hours) blue emission	Significant mass at high v (~0.8c)	Rise time?
Shock cooling	Very early (hours) / early (days) blue emission	Bright emission in the first few hours	Velocity distribution from radio non consistent with optical (if probing the same ejecta) Long rise time (no strong UV emission in first hours)
r-process heating in low opacity dynamical high Y_e polar ejecta	Early blue emission	Viewing angle dependence?	See it in NS-BH Merger (no strong contact interface)
r-process heating in low opacity wind	Early blue emission	Lower velocities	All events show (same?) blue emission?
Boosted cocoon radioactive decay	Early blue emission		
r-process heating in high opacity (~10) ejecta	Late IR emission	[3+ parameters]	See an event that's too bright for this heating
r-process heating in not so high opacity (~1) ejecta	Late IR emission	Might have viewing angle dependence Requires low X_lanth ~ 10^-3 [8 parameters]	Can not fit colors with single component even with different velocity distribution
Central heating (e.g. accretion disk, fallback, magnetar) reprocessed by ejecta	All (esp. brighter kilonova candidates)	Decouples opacity from mass (energy source from reprocessing mechanism)	Source not revealed in late-time spectra

What will be different in NS-BH?

1. Less polar dynamical ejecta (unless spin misaligned with orbital angular momentum)
2. Less likelihood for a choked jet, so no weak GRB.
3. No NS remnant after the merger, so no high Y_e wind from neutrino irradiation, unless the disk or its formation is enough to irradiate?
4. No ejecta for ~10:1 or higher mass ratio with ~aligned spin and orbit. But not necessarily no emission.