1 What is the purpose of ECM

The purpose of ECM is to “jamme” someone, which means to prohibite the targeted ship to lock anything else in space (ships, cans, whatever) or to break the current locks. ECM is a probability based gaming method, based on the ratio between your own **ECM strength** (JS) and the **sensor strength of your target** (SS).

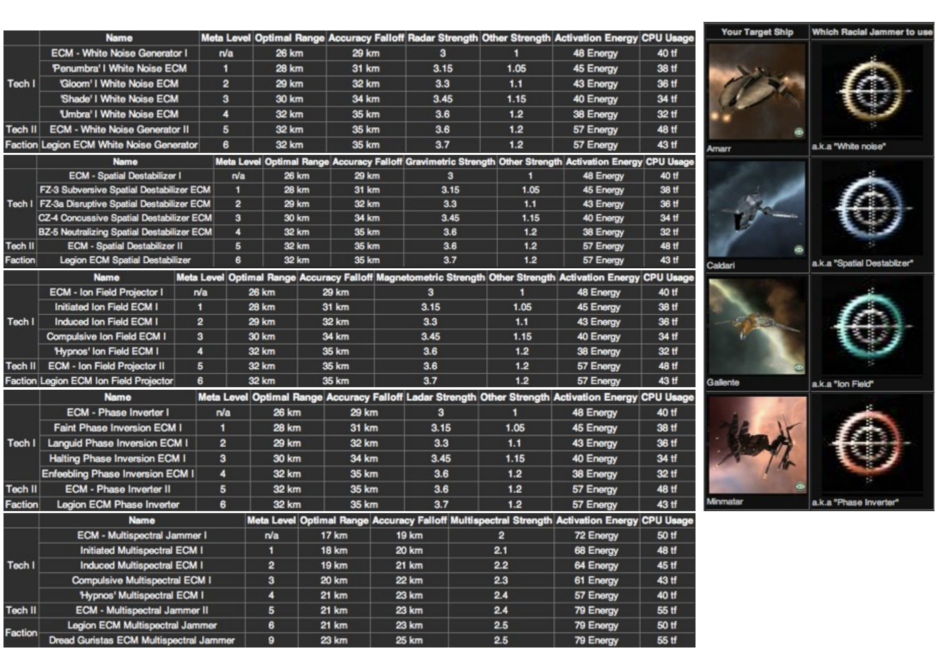
ECM probability is influenced by

1. Signal Dispersion (5% ECM strenght per level)
2. Long Distance Jamming (10% Optimal Range per level)
3. Frequency Modulation (10% Falloff Range per level)
4. Electronic Warefare (5% reduction of cap usage per level)
5. ship skills (e.g. recon skill)

2 Modules/Rigs/Implants

There are different modules and ships which provides you more ECM strength and range or more defence.

- Jammers: Racial’s, Multi’s
  Two types of jammers are available. Racial jammer are nearly exclusivly made to jam a specific race, whereas it is almost useless against the other three. Multi jammers are not as strong as the racials against a single race but equal in strength against all four races.
    1. Caldari . . . Gravimetric sensor strength
    2. Minmatar . . . Ladar sensor strength
    3. Gallente . . . Magnometric sensor strength
    4. Amarr . . . Radar sensor strength
- Implants:
    1. LG Centurion Set (bonus to optimal range)
    2. Slot 9 EW-90X capacitor useage
- Rigs:
    1. Particle Dispersion Projector (Bonus on Optimal Range)
    2. Particle Dispersion Augmentor (Bonus on ECM strength)
- Low slots
    1. Signal Distortion Amplifier (Bonus to Range and ECM strength)
    2. Backup Arrays (increases the sensor strength of the ship, ECCM)
- Med slots
    1. ECM Bursts (Lockbreaker, this is not a Jammer!)
    2. ECCM (Electronic counter counter measure, to increase the sensor strength of your own ship)



	Name	Meta Level	Optimal Range	Accuracy Falloff	Radar Strength	Other Strength	Activation Energy	CPU Usage
Tech I	ECM - White Noise Generator I	n/a	26 km	29 km	3	1	48 Energy	40 tf
	'Penumbra' I White Noise ECM	1	28 km	31 km	3.15	1.05	45 Energy	38 tf
	'Gloom' I White Noise ECM	2	29 km	32 km	3.3	1.1	43 Energy	36 tf
	'Shade' I White Noise ECM	3	30 km	34 km	3.45	1.15	40 Energy	34 tf
	'Umbra' I White Noise ECM	4	32 km	35 km	3.6	1.2	38 Energy	32 tf
Tech II	ECM - White Noise Generator II	5	32 km	35 km	3.6	1.2	57 Energy	48 tf
Faction	Legion ECM White Noise Generator	6	32 km	35 km	3.7	1.2	57 Energy	43 tf

	Name	Meta Level	Optimal Range	Accuracy Falloff	Gravimetric Strength	Other Strength	Activation Energy	CPU Usage
Tech I	ECM - Spatial Destabilizer I	n/a	26 km	29 km	3	1	48 Energy	40 tf
	FZ-3 Subversive Spatial Destabilizer ECM	1	28 km	31 km	3.15	1.05	45 Energy	38 tf
	FZ-3a Disruptive Spatial Destabilizer ECM	2	29 km	32 km	3.3	1.1	43 Energy	36 tf
	CZ-4 Concussive Spatial Destabilizer ECM	3	30 km	34 km	3.45	1.15	40 Energy	34 tf
	BZ-5 Neutralizing Spatial Destabilizer ECM	4	32 km	35 km	3.6	1.2	38 Energy	32 tf
Tech II	ECM - Spatial Destabilizer II	5	32 km	35 km	3.6	1.2	57 Energy	48 tf
Faction	Legion ECM Spatial Destabilizer	6	32 km	35 km	3.7	1.2	57 Energy	43 tf

	Name	Meta Level	Optimal Range	Accuracy Falloff	Magnetometric Strength	Other Strength	Activation Energy	CPU Usage
Tech I	ECM - Ion Field Projector I	n/a	26 km	29 km	3	1	48 Energy	40 tf
	Initiated Ion Field ECM I	1	28 km	31 km	3.15	1.05	45 Energy	38 tf
	Induced Ion Field ECM I	2	29 km	32 km	3.3	1.1	43 Energy	36 tf
	Compulsive Ion Field ECM I	3	30 km	34 km	3.45	1.15	40 Energy	34 tf
	'Hypnos' Ion Field ECM I	4	32 km	35 km	3.6	1.2	38 Energy	32 tf
Tech II	ECM - Ion Field Projector II	5	32 km	35 km	3.6	1.2	57 Energy	48 tf
Faction	Legion ECM Ion Field Projector	6	32 km	35 km	3.7	1.2	57 Energy	43 tf

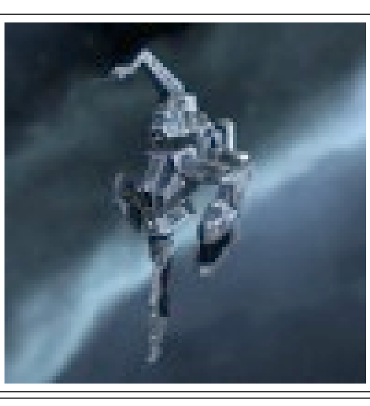
	Name	Meta Level	Optimal Range	Accuracy Falloff	Ladar Strength	Other Strength	Activation Energy	CPU Usage
Tech I	ECM - Phase Inverter I	n/a	26 km	29 km	3	1	48 Energy	40 tf
	Faint Phase Inversion ECM I	1	28 km	31 km	3.15	1.05	45 Energy	38 tf
	Languid Phase Inversion ECM I	2	29 km	32 km	3.3	1.1	43 Energy	36 tf
	Halting Phase Inversion ECM I	3	30 km	34 km	3.45	1.15	40 Energy	34 tf
	Enfeebling Phase Inversion ECM I	4	32 km	35 km	3.6	1.2	38 Energy	32 tf
Tech II	ECM - Phase Inverter II	5	32 km	35 km	3.6	1.2	57 Energy	48 tf
Faction	Legion ECM Phase Inverter	6	32 km	35 km	3.7	1.2	57 Energy	43 tf

	Name	Meta Level	Optimal Range	Accuracy Falloff	Multispectral Strength	Activation Energy	CPU Usage
Tech I	ECM - Multispectral Jammer I	n/a	17 km	19 km	2	72 Energy	50 tf
	Initiated Multispectral ECM I	1	18 km	20 km	2.1	68 Energy	48 tf
	Induced Multispectral ECM I	2	19 km	21 km	2.2	64 Energy	45 tf
	Compulsive Multispectral ECM I	3	20 km	22 km	2.3	61 Energy	43 tf
	'Hypnos' Multispectral ECM I	4	21 km	23 km	2.4	57 Energy	40 tf
Tech II	ECM - Multispectral Jammer II	5	21 km	23 km	2.4	79 Energy	55 tf
Faction	Legion ECM Multispectral Jammer	6	21 km	23 km	2.5	79 Energy	50 tf
	Dread Guristas ECM Multispectral Jammer	9	23 km	25 km	2.5	79 Energy	55 tf

Your Target Ship	Which Racial Jammer to use
Amarr	a.k.a "White noise"
Caldari	a.k.a "Spatial Destabilizer"
Gallente	a.k.a "Ion Field"
Minmatar	a.k.a "Phase Inverter"

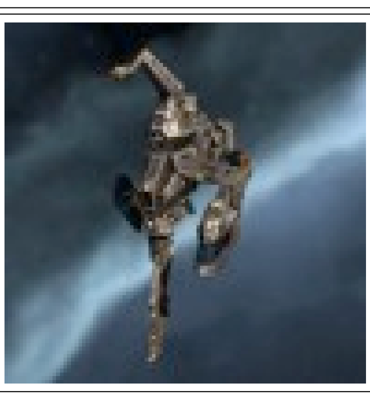
Conclusion: Racial Jammer => more ECM strength **and** more range

3 Ships



Griffin
15% Bonus on jammer strength
10% Bonus on capacitor usage

Blackbird
15% Bonus on jammer strength
10% Bonus on optimal range and falloff

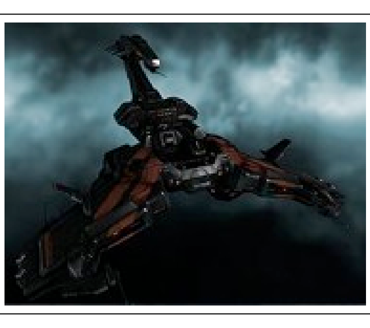


Kitsune
20% Bonus on jammer strength
10% Bonus on capacitor usage
10% Bonus to optimal range
5% Bonus to capacitor usage

Rook
5% Bonus on Heavy/Heavy Assault missile rate of fire
10% Bonus on capacitor usage
30% Bonus on ECM strength
10% Bonus on Heavy/Heavy Aussault missile velocity

Scorpion
15% Bonus on jammer strength
20% Bonus on optimal Range and falloff
20% Bonus on ECM burst range

Falcon
30% Bonus on jammer strength
10% Bonus on capacitor usage
5% Bonus on medium hybrid damage
96-10080% Bonus on Liquid Ozone consumption
50% Bonus on cyno duration



Widow
30% Bonus on jammer strength
125% Bonus on ships velocity while cloaked

4 Let’s do some Math - Propabilities

4.1 Little example - Coin toss

What’s the propability to get heads?

- Two possible outcomes (heads or tails)
- Single independent try
- Result unit is percent

$$E[\%] = (1/2) * 100 = 50\% \tag{1}$$

What is the propbability of one minmatar racial jammer (JS=3.6) to hit a Hurricane (SS=16)?

- Minmatar Racial on Hurrican

$$E[\%] = (JS/SS) * 100 = (3.6/16) * 100 = 22.5\% \tag{2}$$

- Minmatar Racial on DrakeF

$$E[\%] = (1.2/19) * 100 = 6.3\% \tag{3}$$

- Multi on Hurricane

$$E[\%] = (2.4/16) * 100 = 15\% \tag{4}$$

Not the best results even with a racial jammer we only get a probability of 22.5% which is almost only one out of five trys would be a hit. But there are some enhancements .-)

4.2 Propabilities + Skills

Szenario:

- All jamming related skill at lvl 4
- Recon skill at lvl 5
- Used ship is a Falcon

This leads to an overall JS with racial jammers of 14.27.
With the new much higher JS strength what is the probability to hit a Hurricane.

- Minmatar Racial on Hurrican

$$E[\%] = (JS/SS)*100 = (14.27/16)*100 = 89.19\% \tag{5}$$

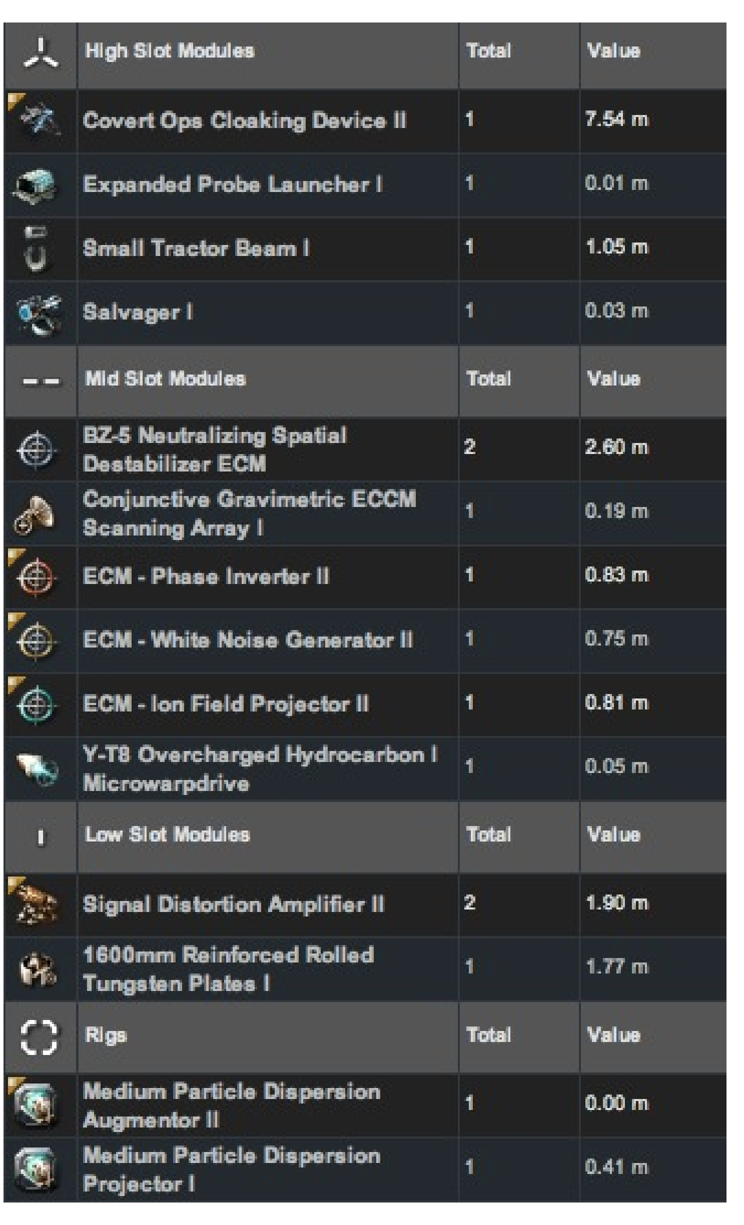
- Minmatar Racial on Drake

$$E[\%] = (4.76/19) * 100 = 25.05\% \tag{6}$$

- Multi on Hurricane

$$E[\%] = (9.51/16) * 100 = 59.43\% \tag{7}$$

This shows an incredible increase to hit a target with an **SINGLE** racial jammer. Even the other three races can be hit with a 1/4 probability to hit.



	High Slot Modules	Total	Value
	Covert Ops Cloaking Device II	1	7.54 m
	Expanded Probe Launcher I	1	0.01 m
	Small Tractor Beam I	1	1.05 m
	Salvager I	1	0.03 m
	Mid Slot Modules	Total	Value
	BZ-5 Neutralizing Spatial Destabilizer ECM	2	2.60 m
	Conjunctive Gravimetric ECCM Scanning Array I	1	0.19 m
	ECM - Phase Inverter II	1	0.83 m
	ECM - White Noise Generator II	1	0.75 m
	ECM - Ion Field Projector II	1	0.81 m
	Y-T8 Overcharged Hydrocarbon I Microwarpdrive	1	0.05 m
	Low Slot Modules	Total	Value
	Signal Distortion Amplifier II	2	1.90 m
	1600mm Reinforced Rolled Tungsten Plates I	1	1.77 m
	Rigs	Total	Value
	Medium Particle Dispersion Augmentor II	1	0.00 m
	Medium Particle Dispersion Projector I	1	0.41 m

4.3 Multiple Jammer on a single target

4.3.1 Two racial Jammers

Same Szenario:

- All jamming related skill at lvl 4
- Recon skill at lvl 5
- Used ship is a Falcon

What is the probabilty to hit a target with two racial jammers (JS=14.27).The target is a ECCM fitted Scimitar (SS=33).
The Formular for multiple jammers is defined with

- n . . . number of ECM modules of the same strength/type
- JS . . . jammer strength with skills and ship bonus
- SS . . . sensor strength of your target (with modules and skills)

$$E[\%] = (1 - (1 - JS/SS)^n) * 100 \tag{8}$$

This leads to the following numbers:

- Two Minmatar Racial on Scimitar with ECCM

$$E[\%] = (1 - (1 - JS/SS)^n) * 100 = (1 - (1 - 14.27/33)^2) * 100 = 67.8\% \tag{9}$$

- Two Minmatar Racial on Basilisk with ECCM

$$E[\%] = (1 - (1 - 4.76/43)^2) * 100 = 20.91\% \tag{10}$$

- Two Multi on Scimitar with ECCM

$$E[\%] = (1 - (1 - 9.51/33)^2) * 100 = 49.33\% \tag{11}$$

The effort of using racial compared to multis is in this case a little less than 20%.

4.3.2 Rainbow fit

Same Szenario:

- All jamming related skill at lvl 4
- Recon skill at lvl 5
- Used ship is a Falcon

What is the probability to hit a target with a full rainbow fit?
The ship used is a Falcon against a Raven (SS=22). The Falcon provides us a JS with the Caldari jammer of 14.27 with the other three only 4.76.
The formular changes slightly to a multiplication of each and every jammer module type group:

$$E[\%] = ((1 - ((1 - JS/SS) * (1 - JS/SS) * (1 - JS/SS) * (1 - JS/SS))) * 100 \tag{12}$$

$$E[\%] = (1 - ((1 - 14.27/22) * (1 - 4.76/22) * (1 - 4.76/22) * (1 - 4.76/22))) * 100 = 83.09\% \tag{13}$$

If your Falcon is for example fitted with 4 Caldari jammers (JS=14.27) we would hit the target with a problability of

$$E[\%] = (1 - (1 - 14.27/22)^4) * 100 = 98.47\% \tag{14}$$

If your Falcon is for example fitted with 4 Multis (JS=9.51) we would hit the target with a problability of

$$E[\%] = (1 - (1 - 9.51/22)^4) * 100 = 89.61\% \tag{15}$$

This leads to the conclusion that if your in a fleet it is the best thing to ask your fc which kind of jammers you should fit. If your a alone or in small scale fleets roaming and/or the targets are absolutly unknown it could be a better idea to fit multis instead of racial jammers.

4.4 ECM Drones

Some number crunching for drones:

- Hornet EC-300 (light) -> JS=1
- Vespa EC-600 (medium) -> JS=1.5
- Wasp EC-900 (heavy) -> JS=2

The probability to hit a Drake (SS=19) with five drone of the same type.

- 5 Hornets

$$E[\%] = (1 - (1 - 1/19)^5) * 100 = 23.69\% \tag{16}$$

- 5 Vespas

$$E[\%] = (1 - (1 - 1.5/19)^5) * 100 = 33.71\% \tag{17}$$

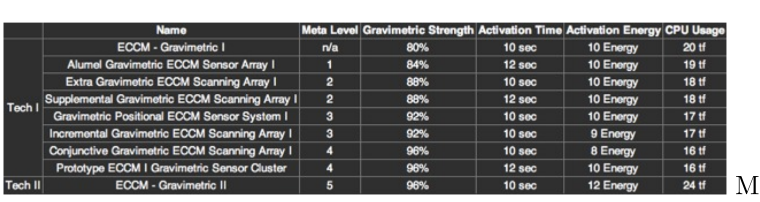
- 5 Wasps

$$E[\%] = (1 - (1 - 2/19)^5) * 100 = 42.66\% \tag{18}$$

Unfortunately there is no skill to increase the ECM strength of drones.

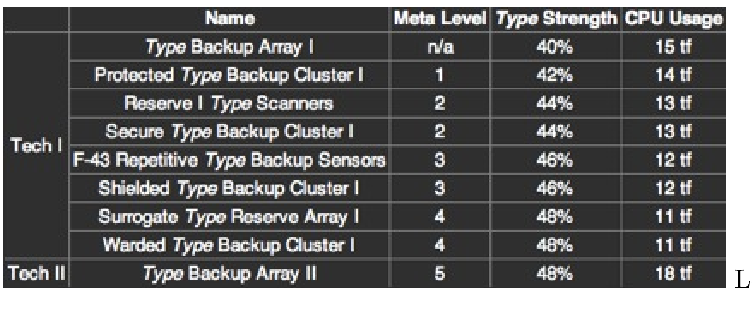
5 ECCM

Two diffenet types are available to increase your own sensor strength and one to increase your targets sensor strength (Projected ECCM Modules).
For example:



	Name	Meta Level	Gravimetric Strength	Activation Time	Activation Energy	CPU Usage
Tech I	ECCM - Gravimetric I	n/a	80%	10 sec	10 Energy	20 tf
	Alumel Gravimetric ECCM Sensor Array I	1	84%	12 sec	10 Energy	19 tf
	Extra Gravimetric ECCM Scanning Array I	2	88%	10 sec	10 Energy	18 tf
	Supplemental Gravimetric ECCM Scanning Array I	2	88%	12 sec	10 Energy	18 tf
	Gravimetric Positional ECCM Sensor System I	3	92%	10 sec	10 Energy	17 tf
	Incremental Gravimetric ECCM Scanning Array I	3	92%	10 sec	9 Energy	17 tf
	Conjunctive Gravimetric ECCM Scanning Array I	4	96%	10 sec	8 Energy	16 tf
	Prototype ECCM I Gravimetric Sensor Cluster	4	96%	12 sec	10 Energy	16 tf
Tech II	ECCM - Gravimetric II	5	96%	10 sec	12 Energy	24 tf

Med-Slot - eg. Gravi



	Name	Meta Level	*Type* Strength	CPU Usage
Tech I	*Type* Backup Array I	n/a	40%	15 tf
	Protected *Type* Backup Cluster I	1	42%	14 tf
	Reserve I *Type* Scanners	2	44%	13 tf
	Secure *Type* Backup Cluster I	2	44%	13 tf
	F-43 Repetitive *Type* Backup Sensors	3	46%	12 tf
	Shielded *Type* Backup Cluster I	3	46%	12 tf
	Surrogate *Type* Reserve Array I	4	48%	11 tf
	Warded *Type* Backup Cluster I	4	48%	11 tf
Tech II	*Type* Backup Array II	5	48%	18 tf

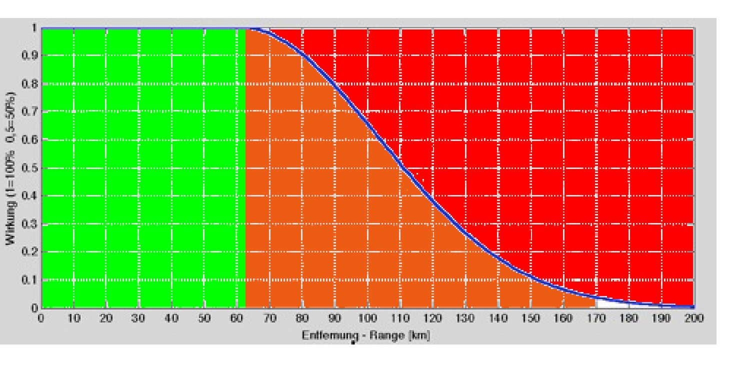
Low-Slot - type can be replaced with Grav/Ladar/Magno/Radar

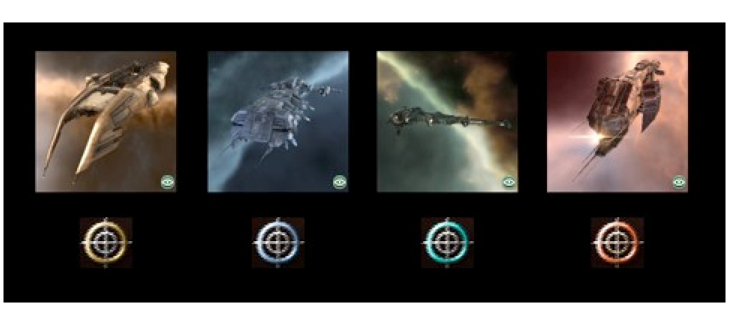
6 Hints to use ECM

If you fighting in an ECM ship your tank is basicly based on your ECM strength and your distance to the target. Especially for jamming it is essential to avoid to fight in falloff.

For example:

- ECM module with 61km optmal and 50km falloff
- ECM strength decreases rapidly after the optimal range
- 14 JS in optimal is droping to 7 on 111km range
- e.g. Raven (SS=22) with one racial
    - $E[\%] = (14/22) * 100 = 63.63\%$
    - $E[\%] = (7/22) * 100 = 31.81\%$
- **Allway try to prevent falloff range fights**





Hints:

- The backgroud of the image shown for target locks indicates the jammer you should use.
- Always flight aligned to warp off if you get hit.
- If you can, because it is a hot spot, create tactical bookmarks with optimals for jamming and on grid warp points.
- turn auto-repeat off for the jamming modules
- do not jamm the primary target unless your are told to (jammed targets are not shooting == de-aggressed)
- find your targets, e.g. by name (in big fleets) or priorities them by ship type eg. Jammer, logies, dps
- Capitals (Supers and Titans can’t be jammed, same for Triage/Siege):
    - Chimera: sensor strength 80, with ECCM 157
    - Archon: sensor strength 72, with ECCM 141
    - Nidhoggur: sensor strength 68, with ECCM 133
    - Thanatos: sensor strength 76, with ECCM 149