$\widehat{h}_{si}$

$y_{gs}[t]$

$x_1[t]$

$tg\_block_{d}iagram.eps$ Unmanned Aerial Vehicle 1 $(UAV-1)$ and Unmanned Aerial Vehicle 2 $(UAV-2)$ operating in HD mo

$x_{si}[t] =$

$y_{gs}[t]$

$h_{1,g}[t]$

h_{si}

$$y_{gs}[t] = \sqrt{\Omega_X}\, h_{1,g}[t] x_1[t] + \sqrt{\Omega_X \alpha_{g,g}}\, |h_{si}| \gamma_\phi w_\phi[t] + \sqrt{\Omega_X \alpha_{g,g}}\, |\widetilde{h}_{si}| x_{si}[t] + w_g[t] \tag{1}$$

$\widetilde{h}_{si}$

$h_{si} =$

$h_{si} -$

$\widehat{h}_{si}$

$\widehat{h}_{si}$

$\widetilde{h}_{si}$

$w_g[t]$

σ_g^2

$w_\phi[t]$

γ_ϕ

3

σ_g^2

Ω_X

P_t

$d_{1,g}$

$$\Omega_X \propto \frac{P_t}{(d_{1,g})^n \sigma_g^2} \tag{2}$$

$\alpha_{i,j}$

$$\alpha_{i,j} = \left(\frac{d_{1,g}}{d_{i,j}}\right)^n,\; i \in \{g,1\},\; j \in \{g,2\} \tag{3}$$

To enable the sharing of the spectrum for CNPC and non-CNPC links with joint detector, the block length of the codes used, e.g., LDPC codes, should be the same

??
$\Omega_X \alpha_{g,g}$
$x_{gs}[t]$
$x_1[t]$
$h_{g,2}[t]$
$h_{1,2}[t]$
$w_2[t]$
σ_2^2

$$y_2[t] = \sqrt{\Omega_X \alpha_{g,2}} h_{g,2}[t] x_{gs}[t] + \sqrt{\Omega_X \alpha_{1,2}} h_{1,2}[t] x_1[t] + w_2[t] \tag{4}$$

$\Omega_X \alpha_{g,2}$
$\Omega_X \alpha_{1,2}$
$x_1[t]$
$x_1[t]$
$x_{gs}[t]$
?
$x_{gs}[t]$
$x_1[t]$
?
R_1^i
R_{gs}^i
$i \in$
$\{HBD, HD\}$
$R_{sum}^i =$
$R_1^i +$
R_{gs}^i
?
$R_j^{HBD} =$
$\frac{1}{2} R_j^{HD}$
$j \in$
$\{1, gs\}$
$X_{gs} =$
$\Omega_X \alpha_{g,2} |h_{g,2}|^2$
$Y_1 =$
$\Omega_X \alpha_{1,2} |h_{1,2}|^2$
X_{gs}
Y_1
K
(R^{HBD})
$fig/rate_r egions.eps The achievable instantaneous rate regions of the II, SIC and joint detectors (unshaded areas) at UAV$
$\mathcal{O}_{JD}^{1}$
$\mathcal{O}_{JD}^{3}$
$\mathcal{O}_{JD}^{2}$
$A4$
$A1$
$A3$
$A1$
$A2$
??

$$\mathcal{O}_2^{HBD(JD)} = \mathcal{O}_{JD}^1 \cup \mathcal{O}_{JD}^2 \tag{5}$$

$$where \quad \mathcal{O}_{JD}^1 = \left\{ h_{g,2}, h_{1,2} : R_{gs}^{HBD} > \log_2 \left(1 + X_{gs} \right) \right\}, \tag{6}$$

$$\mathcal{O}_{JD}^2 = \left\{ h_{g,2}, h_{1,2} : R_1^{HBD} + R_{gs}^{HBD} > \log_2 \left(1 + X_{gs} + Y_1 \right), \right.$$

$$\left. \log_2 \left(1 + \frac{X_{gs}}{1 + Y_1} \right) \le R_{gs}^{HBD} \le \log_2 \left(1 + X_{gs} \right) \right\}. \tag{7}$$

The joint de-tec-tor out-age event $(\mathcal{O}_2^{HBD(JD)})$ oc-curs if SOI de-tec-tion fails $(\mathcal{O}_{JD}^1)$ or if the sum rate con-straint is