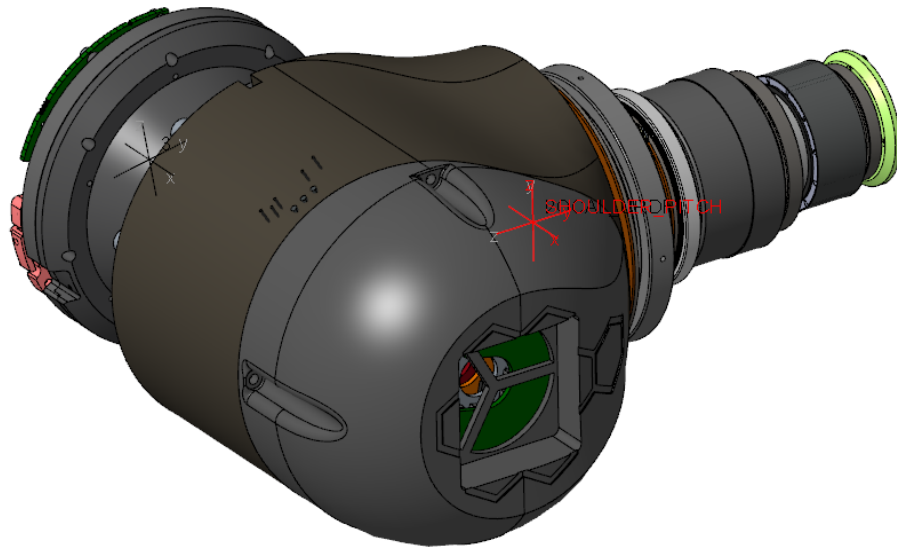


Walkimon URDF DATA

# Shoulder\_pitch



VOLUME = 4.0842136e+05 MM<sup>3</sup>  
SURFACE AREA = 3.7139426e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 4.8059864e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 1.9628675e+00 KILOGRAM

CENTER OF GRAVITY with respect to SHOULDER\_PITCH coordinate frame:  
X Y Z -7.4457212e+00 -3.4107960e+01 1.0978102e-01 MM

INERTIA with respect to SHOULDER\_PITCH coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 7.6383030e+03 -8.6277588e+02 1.6694014e+01  
Iyx Iyy Iyz -8.6277588e+02 3.5011754e+03 -4.8342538e+01  
Izx Izy Izz 1.6694014e+01 -4.8342538e+01 9.2844679e+03

INERTIA at CENTER OF GRAVITY with respect to SHOULDER\_PITCH coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 5.3547717e+03 -3.6428926e+02 1.5089568e+01  
Iyx Iyy Iyz -3.6428926e+02 3.3923328e+03 -5.5692312e+01  
Izx Izy Izz 1.5089568e+01 -5.5692312e+01 6.8921413e+03

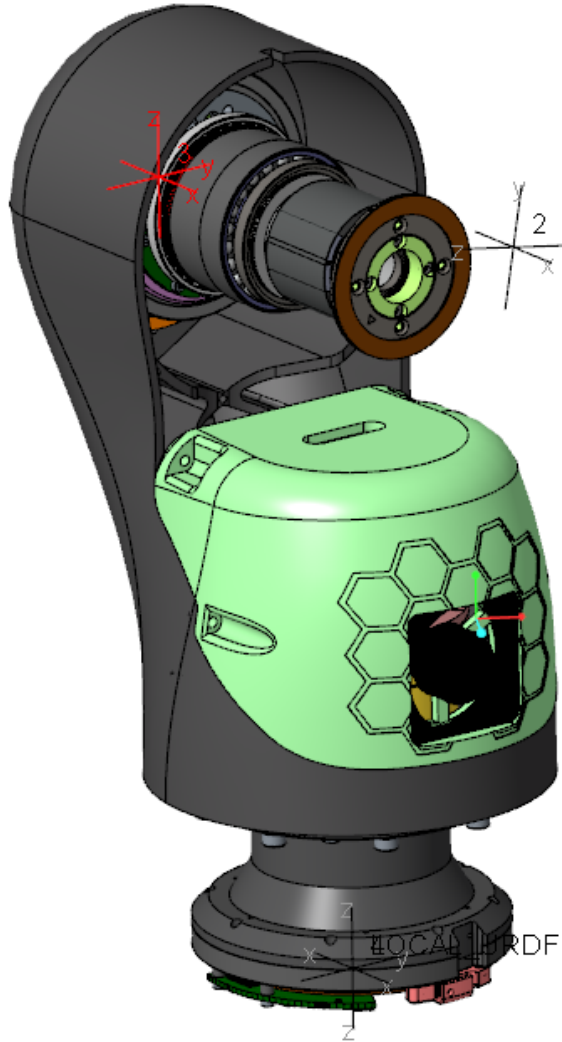
PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3 3.3261291e+03 5.4197988e+03 6.8933178e+03

ROTATION MATRIX from SHOULDER\_PITCH orientation to PRINCIPAL AXES:  
0.17662 -0.98418 0.01391  
0.98417 0.17637 -0.01735  
0.01462 0.01676 0.99975

ROTATION ANGLES from SHOULDER\_PITCH orientation to PRINCIPAL AXES (degrees):  
angles about x y z 0.994 0.797 79.826

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3 4.1164615e+01 5.2546777e+01 5.9260956e+01 MM

# Shoulder\_roll



VOLUME = 5.2738006e+05 MM<sup>3</sup>  
SURFACE AREA = 4.2768894e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 3.5260739e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 1.8595811e+00 KILOGRAM

CENTER OF GRAVITY with respect to 3 coordinate frame:  
X Y Z 5.8142302e+01 -5.7450803e-02 -7.7477683e+01 MM

INERTIA with respect to 3 coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 2.4939327e+04 -3.1577076e+01 1.2145929e+04  
Iyx Iyy Iyz -3.1577076e+01 3.3126505e+04 1.2120711e+00  
Izx Izy Izz 1.2145929e+04 1.2120711e+00 1.0918136e+04

INERTIA at CENTER OF GRAVITY with respect to 3 coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 1.3776643e+04 -3.7788675e+01 3.7690171e+03  
Iyx Iyy Iyz -3.7788675e+01 1.5677464e+04 9.4893549e+00  
Izx Izy Izz 3.7690171e+03 9.4893549e+00 4.6317657e+03

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3 3.2785707e+03 1.5127895e+04 1.5679407e+04

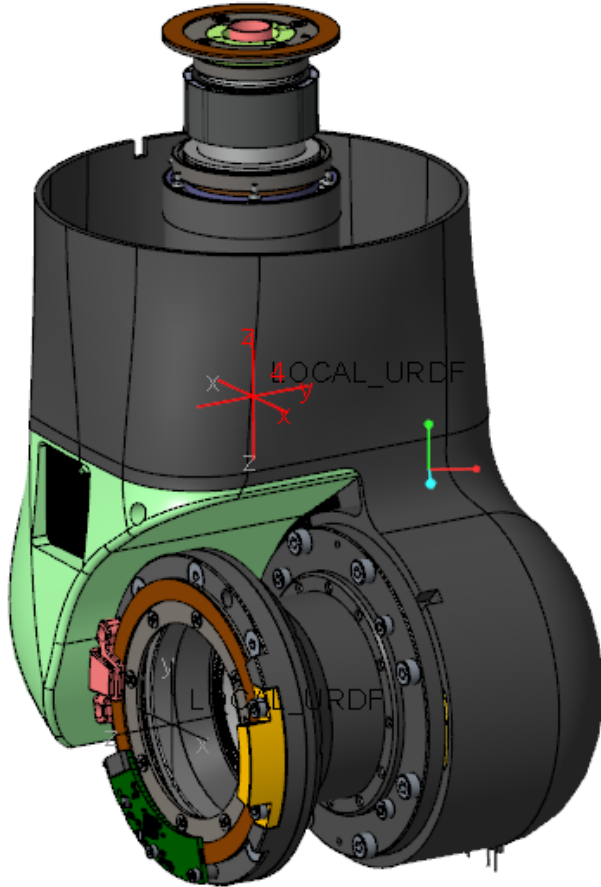
ROTATION MATRIX from 3 orientation to PRINCIPAL AXES:

-0.33791	0.93952	-0.05591
-0.00175	0.05878	0.99827
0.94118	0.33742	-0.01822

ROTATION ANGLES from 3 orientation to PRINCIPAL AXES (degrees):  
angles about x y z -91.045 -3.205 -109.782

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3 4.1988921e+01 9.0194840e+01 9.1824221e+01 MM

# Shoulder\_yaw



VOLUME = 4.5522556e+05 MM<sup>3</sup>  
SURFACE AREA = 4.0974002e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 3.6637021e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 1.6678109e+00 KILOGRAM

CENTER OF GRAVITY with respect to 4 coordinate frame:  
X Y Z 1.4625194e+01 -8.1726720e-01 -2.8333545e+01 MM

INERTIA with respect to 4 coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 7.7880590e+03 1.7632576e+02 1.9116493e+03  
Iyx Iyy Iyz 1.7632576e+02 9.0328478e+03 -1.2856149e+02  
Izx Izy Izz 1.9116493e+03 -1.2856149e+02 4.0316973e+03

INERTIA at CENTER OF GRAVITY with respect to 4 coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 6.4480435e+03 1.5639093e+02 1.2205359e+03  
Iyx Iyy Iyz 1.5639093e+02 7.3372077e+03 -8.9941532e+01  
Izx Izy Izz 1.2205359e+03 -8.9941532e+01 3.6738448e+03

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3 3.2086017e+03 6.8801863e+03 7.3703080e+03

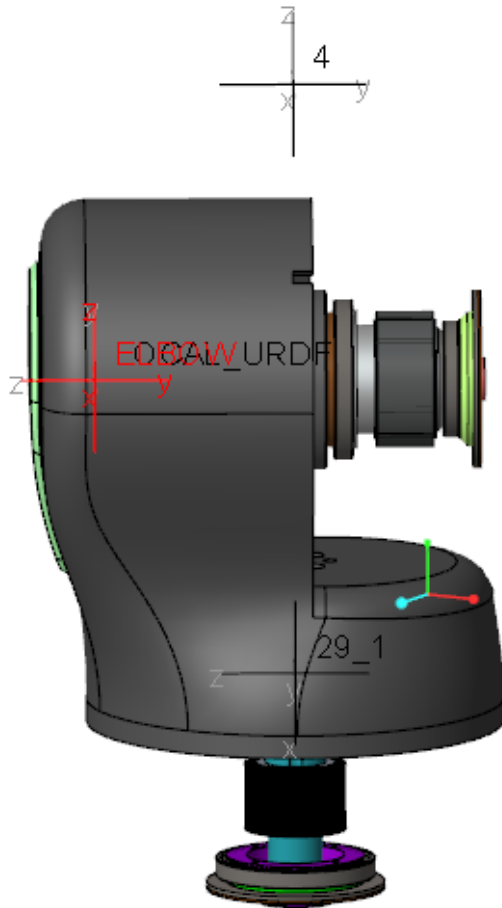
ROTATION MATRIX from 4 orientation to PRINCIPAL AXES:

-0.35380	0.90488	0.23668
0.03376	-0.24053	0.97005
0.93471	0.35120	0.05455

ROTATION ANGLES from 4 orientation to PRINCIPAL AXES (degrees):  
angles about x y z -86.782 13.691 -111.355

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3 4.3861604e+01 6.4228340e+01 6.6476695e+01 MM

# elbow



VOLUME = 2.8053180e+05 MM<sup>3</sup>  
SURFACE AREA = 2.7186630e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 4.6901240e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 1.3157289e+00 KILOGRAM

CENTER OF GRAVITY with respect to ELBOW coordinate frame:  
X Y Z -7.6833067e+00 4.0302205e+01 -4.3492779e+01 MM

INERTIA with respect to ELBOW coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 8.9563516e+03 5.2479490e+02 -8.5890698e+02  
Iyx Iyy Iyz 5.2479490e+02 6.4205251e+03 3.1020123e+03  
Izx Izy Izz -8.5890698e+02 3.1020123e+03 3.9742366e+03

INERTIA at CENTER OF GRAVITY with respect to ELBOW coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 4.3303940e+03 1.1737391e+02 -4.1923199e+02  
Iyx Iyy Iyz 1.1737391e+02 3.8539919e+03 7.9573038e+02  
Izx Izy Izz -4.1923199e+02 7.9573038e+02 1.7594689e+03

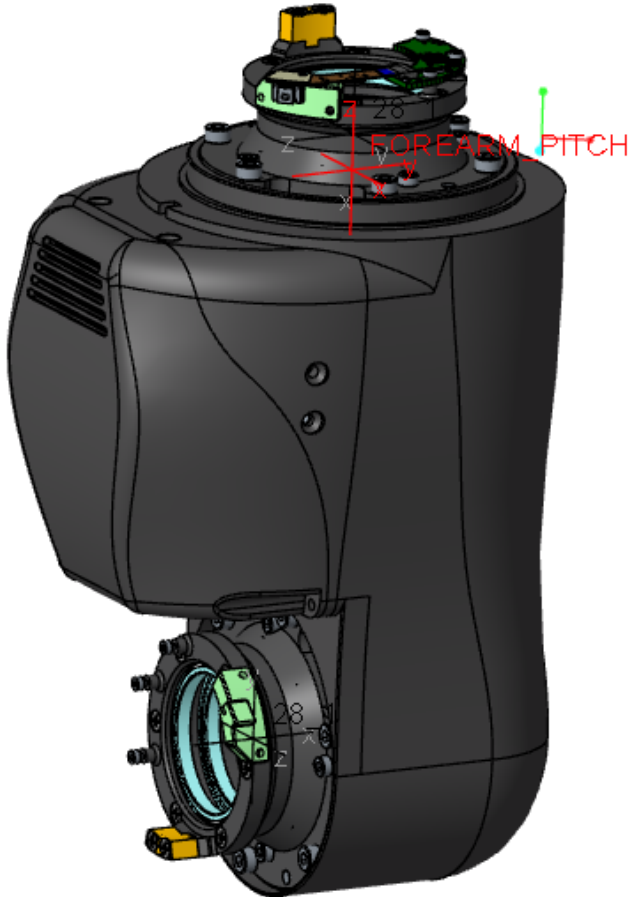
PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3 1.4263634e+03 4.1201959e+03 4.3972955e+03

ROTATION MATRIX from ELBOW orientation to PRINCIPAL AXES:  
0.14807 0.07979 -0.98575  
-0.31450 0.94880 0.02955  
0.93764 0.30564 0.16558

ROTATION ANGLES from ELBOW orientation to PRINCIPAL AXES (degrees):  
angles about x y z -10.120 -80.317 -28.318

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3 3.2925462e+01 5.5959744e+01 5.7810884e+01 MM

# Forearm\_yaw



VOLUME =  $4.1068471e+05$  MM<sup>3</sup>  
SURFACE AREA =  $3.5142556e+05$  MM<sup>2</sup>  
AVERAGE DENSITY =  $3.6301686e-06$  KILOGRAM / MM<sup>3</sup>  
MASS =  $1.4908547e+00$  KILOGRAM

CENTER OF GRAVITY with respect to FOREARM\_PITCH coordinate frame:  
X Y Z  $-1.1079615e-01$   $-1.1590836e+01$   $-7.8160260e+01$  MM

INERTIA with respect to FOREARM\_PITCH coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz  $1.7877176e+04$   $-1.9770838e+01$   $6.4687772e+00$   
Iyx Iyy Iyz  $-1.9770838e+01$   $1.6853105e+04$   $-1.0220281e+03$   
Izx Izy Izz  $6.4687772e+00$   $-1.0220281e+03$   $2.9445030e+03$

INERTIA at CENTER OF GRAVITY with respect to FOREARM\_PITCH coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz  $8.5692128e+03$   $-1.7856252e+01$   $1.9379365e+01$   
Iyx Iyy Iyz  $-1.7856252e+01$   $7.7454159e+03$   $3.2860094e+02$   
Izx Izy Izz  $1.9379365e+01$   $3.2860094e+02$   $2.7441921e+03$

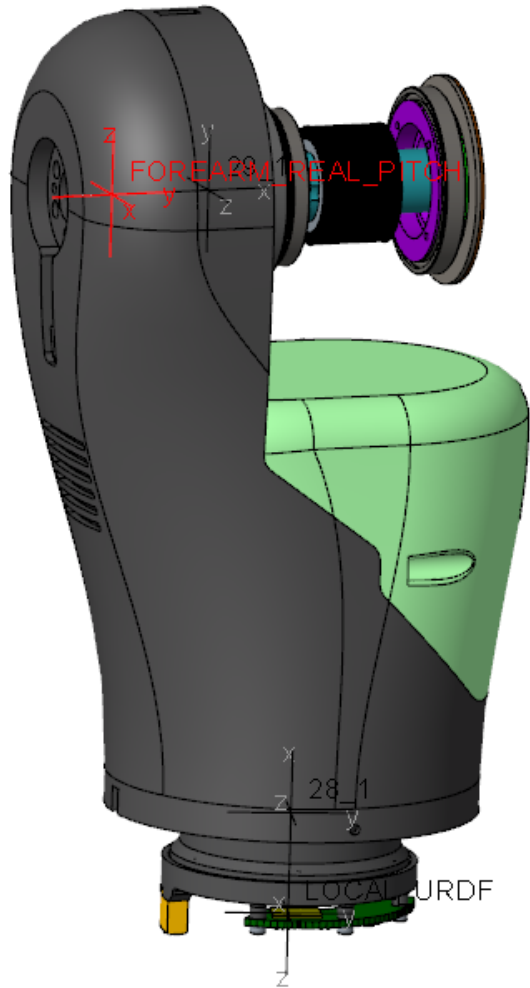
PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3  $2.7226222e+03$   $7.7665726e+03$   $8.5696260e+03$

ROTATION MATRIX from FOREARM\_PITCH orientation to PRINCIPAL AXES:  
-0.00351 0.02062 -0.99978  
-0.06529 0.99765 0.02080  
0.99786 0.06535 -0.00215

ROTATION ANGLES from FOREARM\_PITCH orientation to PRINCIPAL AXES (degrees):  
angles about x y z  $-95.908$   $-88.802$   $-99.654$

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3  $4.2734244e+01$   $7.2176703e+01$   $7.5816420e+01$  MM

# Forearm\_pitch



VOLUME = 2.7686053e+05 MM<sup>3</sup>  
SURFACE AREA = 2.6060639e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 4.0683345e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 1.1263612e+00 KILOGRAM

CENTER OF GRAVITY with respect to FOREARM\_REAL\_PITCH coordinate frame:  
X Y Z -4.6502396e-03 3.8014094e+01 -6.9926878e+01 MM

INERTIA with respect to FOREARM\_REAL\_PITCH coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

Ixx	Ixy	Ixz	1.2322496e+04	-2.7045258e+01	1.9170832e+00
Iyx	Iyy	Iyz	-2.7045258e+01	1.0311424e+04	3.7157578e+03
Izx	Izy	Izz	1.9170832e+00	3.7157578e+03	2.9048112e+03

INERTIA at CENTER OF GRAVITY with respect to FOREARM\_REAL\_PITCH coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

Ixx	Ixy	Ixz	5.1871784e+03	-2.7244370e+01	2.2833496e+00
Iyx	Iyy	Iyz	-2.7244370e+01	4.8037789e+03	7.2165653e+02
Izx	Izy	Izz	2.2833496e+00	7.2165653e+02	1.2771388e+03

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)

I1	I2	I3	1.1351666e+03	4.9429076e+03	5.1900219e+03
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ROTATION MATRIX from FOREARM\_REAL\_PITCH orientation to PRINCIPAL AXES:

-0.00185	0.10701	-0.99426
-0.19303	0.97552	0.10535
0.98119	0.19211	0.01885

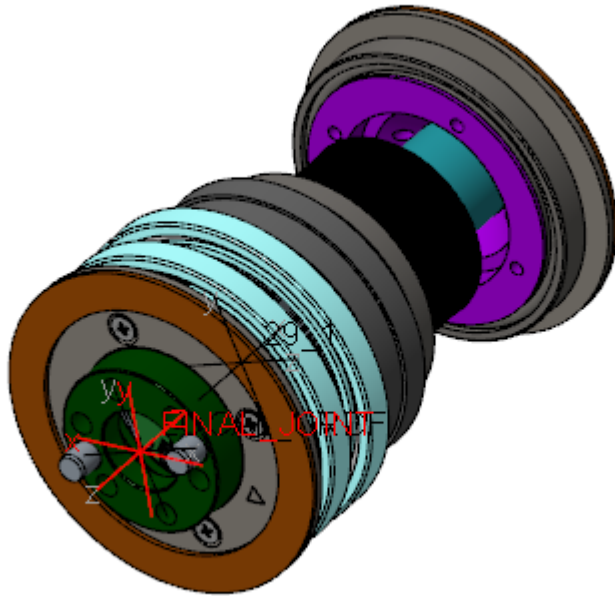
ROTATION ANGLES from FOREARM\_REAL\_PITCH orientation to PRINCIPAL AXES (degrees):  
angles about x y z -79.856 -83.856 -90.991

RADII OF GYRATION with respect to PRINCIPAL AXES:

R1	R2	R3	3.1746142e+01	6.6244892e+01	6.7880611e+01
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 MM

# Forearm\_last joint yaw



VOLUME = 4.3878646e+04 MM<sup>3</sup>  
SURFACE AREA = 5.2821743e+04 MM<sup>2</sup>  
AVERAGE DENSITY = 6.3735851e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 2.7966428e-01 KILOGRAM

CENTER OF GRAVITY with respect to FINAL\_JOINT coordinate frame:  
X Y Z 0.0000000e+00 0.0000000e+00 3.1270570e+01 MM

INERTIA with respect to FINAL\_JOINT coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 4.1762123e+02 9.8651826e-02 0.0000000e+00  
Iyx Iyy Iyz 9.8651826e-02 4.1763942e+02 0.0000000e+00  
Izx Izy Izz 0.0000000e+00 0.0000000e+00 6.0500616e+01

INERTIA at CENTER OF GRAVITY with respect to FINAL\_JOINT coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 1.4415192e+02 9.8651826e-02 0.0000000e+00  
Iyx Iyy Iyz 9.8651826e-02 1.4417010e+02 0.0000000e+00  
Izx Izy Izz 0.0000000e+00 0.0000000e+00 6.0500616e+01

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3 6.0500616e+01 1.4406194e+02 1.4426008e+02

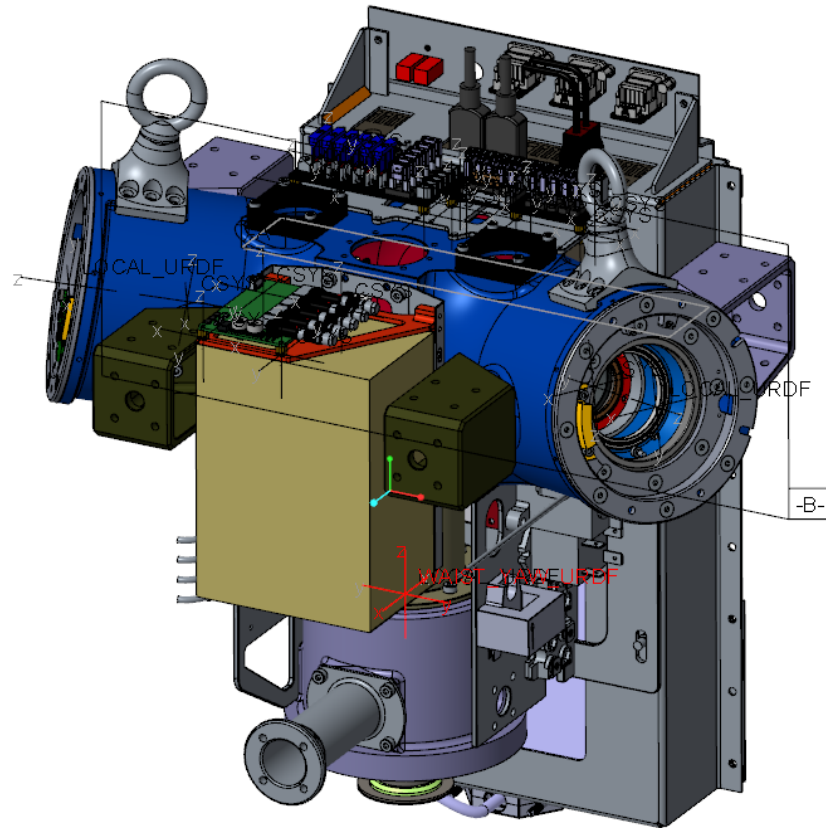
ROTATION MATRIX from FINAL\_JOINT orientation to PRINCIPAL AXES:  
0.00000 0.73884 0.67388  
0.00000 -0.67388 0.73884  
1.00000 0.00000 0.00000

ROTATION ANGLES from FINAL\_JOINT orientation to PRINCIPAL AXES (degrees):  
angles about x y z -90.000 42.367 -90.000

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3 1.4708263e+01 2.2696355e+01 2.2711958e+01 MM



# Torso yaw



VOLUME = 4.0551122e+06 MM<sup>3</sup>  
SURFACE AREA = 1.9553402e+06 MM<sup>2</sup>  
AVERAGE DENSITY = 3.0855606e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 1.2512295e+01 KILOGRAM

CENTER OF GRAVITY with respect to WAIST\_YAW\_URDF coordinate frame:  
X Y Z -5.9646212e+01 1.4305062e+00 4.2741527e+01 MM

INERTIA with respect to WAIST\_YAW\_URDF coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

Ixx	Ixy	Ixz	2.3309971e+05	9.1233034e+02	-1.8318131e+04
Iyx	Iyy	Iyz	9.1233034e+02	2.6720252e+05	-1.0570749e+03
Izx	Izy	Izz	-1.8318131e+04	-1.0570749e+03	1.8479117e+05

INERTIA at CENTER OF GRAVITY with respect to WAIST\_YAW\_URDF coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

Ixx	Ixy	Ixz	2.1021617e+05	-1.5527214e+02	-5.0216602e+04
Iyx	Iyy	Iyz	-1.5527214e+02	1.9982996e+05	-2.9204792e+02
Izx	Izy	Izz	-5.0216602e+04	-2.9204792e+02	1.4025094e+05

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)

I1	I2	I3	1.1403187e+05	1.9983123e+05	2.3643397e+05
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ROTATION MATRIX from WAIST\_YAW\_URDF orientation to PRINCIPAL AXES:

0.46281	-0.00172	-0.88646
0.00385	0.99999	0.00007
0.88645	-0.00345	0.46281

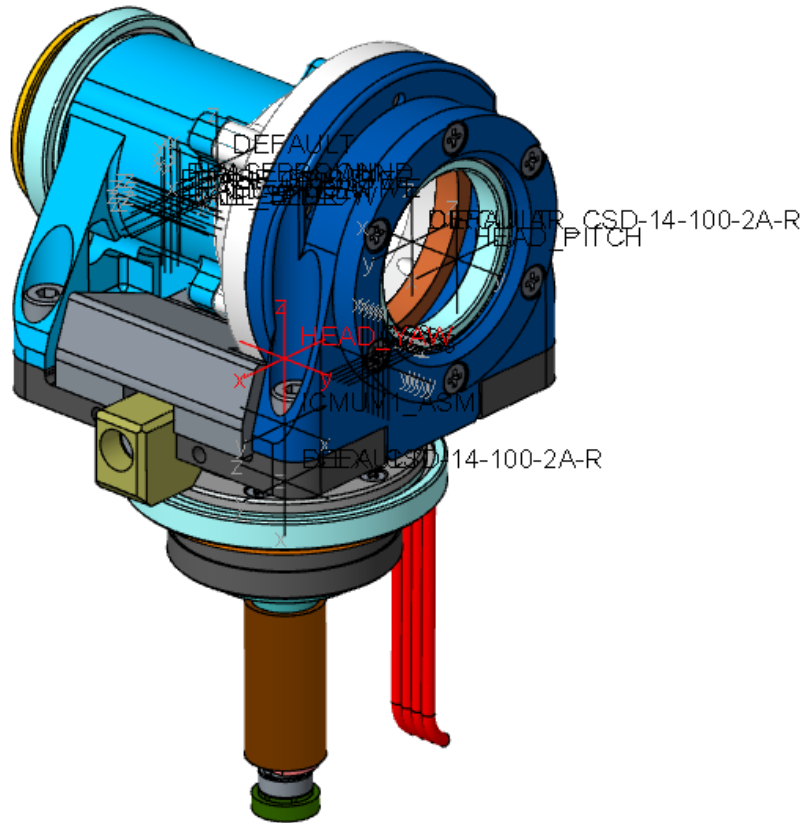
ROTATION ANGLES from WAIST\_YAW\_URDF orientation to PRINCIPAL AXES (degrees):

angles about x	y	z	0.000	-62.431	0.213
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RADII OF GYRATION with respect to PRINCIPAL AXES:

R1	R2	R3	9.5465103e+01	1.2637559e+02	1.3746320e+02	MM
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# Head yaw



VOLUME = 1.1368397e+05 MM<sup>3</sup>  
SURFACE AREA = 9.0100890e+04 MM<sup>2</sup>  
AVERAGE DENSITY = 5.2377357e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 5.9544662e-01 KILOGRAM

CENTER OF GRAVITY with respect to HEAD\_YAW coordinate frame:  
X Y Z 1.7665124e-01 -5.6962982e-01 9.6961910e+00 MM

INERTIA with respect to HEAD\_YAW coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

Ixx Ixy Ixz 5.0019931e+02 1.2343306e-02 -8.9287674e-01  
Iyx Iyy Iyz 1.2343306e-02 4.2558237e+02 8.9412269e+00  
Izx Izy Izz -8.9287674e-01 8.9412269e+00 2.7144961e+02

INERTIA at CENTER OF GRAVITY with respect to HEAD\_YAW coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

Ixx Ixy Ixz 4.4402452e+02 -4.7573996e-02 1.2703055e-01  
Iyx Iyy Iyz -4.7573996e-02 3.6958221e+02 5.6524326e+00  
Izx Izy Izz 1.2703055e-01 5.6524326e+00 2.7123782e+02

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)

I1 I2 I3 2.7091391e+02 3.6990600e+02 4.4402464e+02

ROTATION MATRIX from HEAD\_YAW orientation to PRINCIPAL AXES:

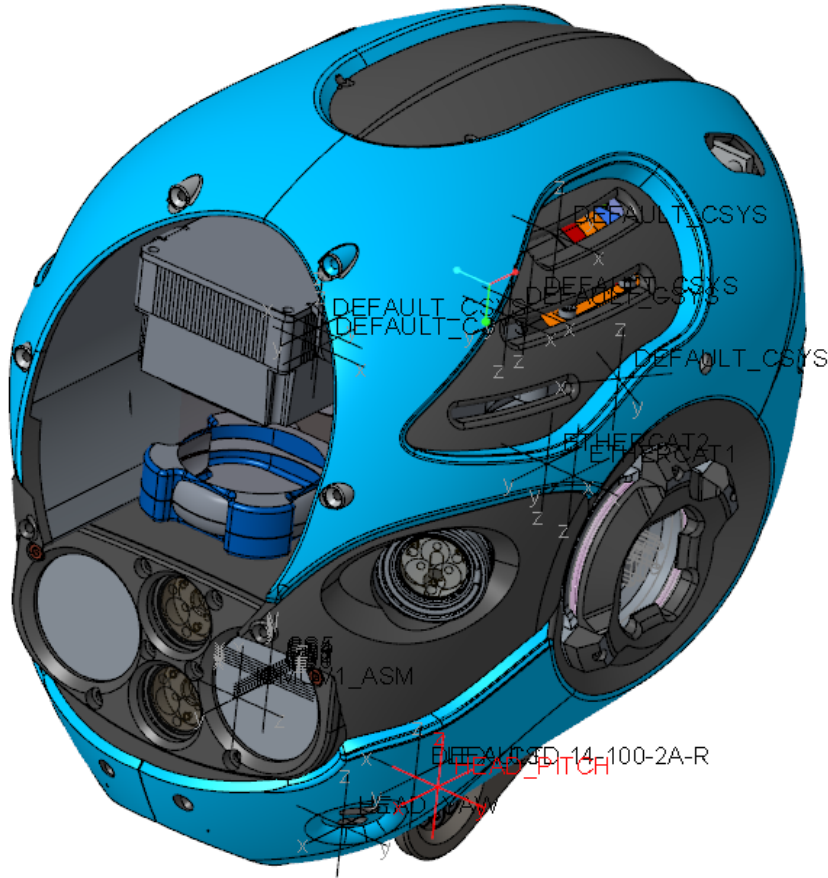
-0.00075	0.00054	-1.00000
-0.05719	0.99836	0.00058
0.99836	0.05719	-0.00072

ROTATION ANGLES from HEAD\_YAW orientation to PRINCIPAL AXES (degrees):  
angles about x y z -140.767 -89.947 -144.045

RADII OF GYRATION with respect to PRINCIPAL AXES:

R1 R2 R3 2.1330166e+01 2.4924375e+01 2.7307511e+01 MM

# Head pitch



VOLUME = 1.0683415e+06 MM<sup>3</sup>  
SURFACE AREA = 5.9958122e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 2.9380576e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 3.1388490e+00 KILOGRAM

CENTER OF GRAVITY with respect to HEAD\_PITCH coordinate frame:  
X Y Z 6.5724785e+00 -3.4569915e+01 1.1402826e+02 MM

INERTIA with respect to HEAD\_PITCH coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

lxx lxy lxz 6.6631055e+04 6.8066704e+02 -3.5583041e+03  
lyx lyy lyz 6.8066704e+02 6.0088590e+04 1.2276506e+04  
lzx lzy lzz -3.5583041e+03 1.2276506e+04 2.5221425e+04

INERTIA at CENTER OF GRAVITY with respect to HEAD\_PITCH coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:

lxx lxy lxz 2.2067171e+04 -3.2510922e+01 -1.2058990e+03  
lyx lyy lyz -3.2510922e+01 1.9140289e+04 -9.6672078e+01  
lzx lzy lzz -1.2058990e+03 -9.6672078e+01 2.1334662e+04

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)

I1 I2 I3 1.9132833e+04 2.0447822e+04 2.2961467e+04

ROTATION MATRIX from HEAD\_PITCH orientation to PRINCIPAL AXES:

0.03748	0.59467	-0.80309
0.99723	-0.07398	0.00824
0.06431	0.80056	-0.59580

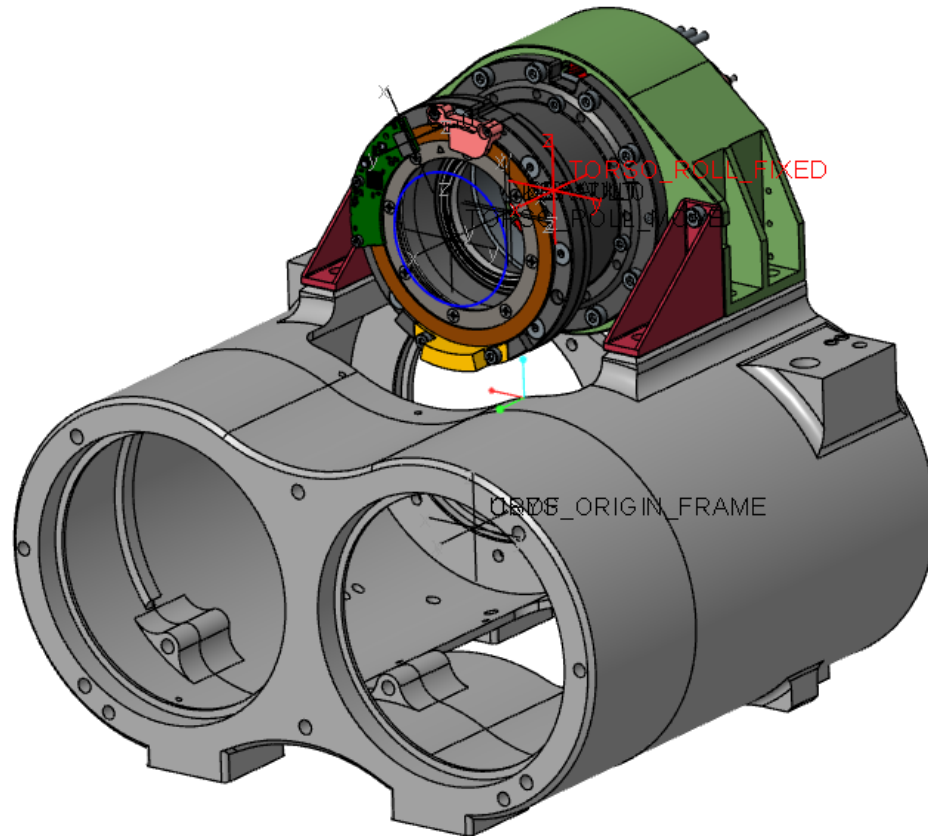
ROTATION ANGLES from HEAD\_PITCH orientation to PRINCIPAL AXES (degrees):

angles about x y z -179.208 53.426 -86.394

RADII OF GYRATION with respect to PRINCIPAL AXES:

R1 R2 R3 7.8073639e+01 8.0712037e+01 8.5529238e+01 MM

# Torso roll fixed



VOLUME = 9.6612646e+05 MM<sup>3</sup>  
SURFACE AREA = 5.4086234e+05 MM<sup>2</sup>  
AVERAGE DENSITY = 3.0284953e-06 KILOGRAM / MM<sup>3</sup>  
MASS = 2.9259094e+00 KILOGRAM

CENTER OF GRAVITY with respect to TORSO\_ROLL\_FIXED coordinate frame:  
X Y Z 2.7038986e+01 -5.1554922e-03 -6.4188178e+01 MM

INERTIA with respect to TORSO\_ROLL\_FIXED coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 3.7768715e+04 9.9086721e+00 9.4301090e+03  
Iyx Iyy Iyz 9.9086721e+00 3.9143447e+04 3.5756843e+00  
Izx Izy Izz 9.4301090e+03 3.5756843e+00 2.7059272e+04

INERTIA at CENTER OF GRAVITY with respect to TORSO\_ROLL\_FIXED coordinate frame:  
(KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
Ixx Ixy Ixz 2.5713610e+04 9.5008024e+00 4.3519496e+03  
Iyx Iyy Iyz 9.5008024e+00 2.4949190e+04 4.5439311e+00  
Izx Izy Izz 4.3519496e+03 4.5439311e+00 2.4920120e+04

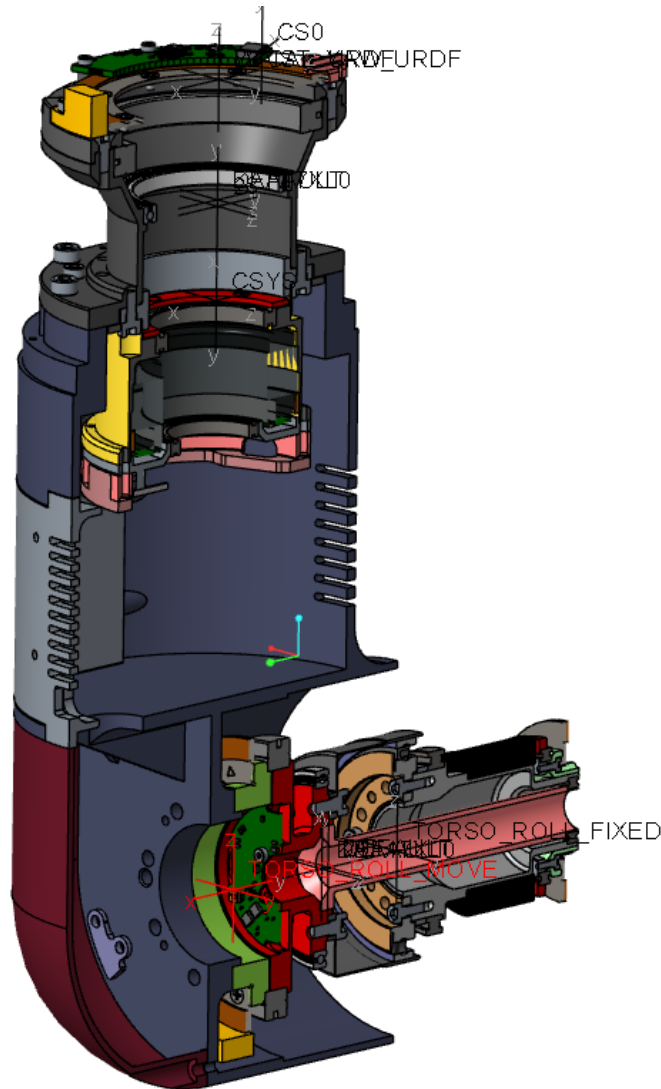
PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
I1 I2 I3 2.0946866e+04 2.4949171e+04 2.9686883e+04

ROTATION MATRIX from TORSO\_ROLL\_FIXED orientation to PRINCIPAL AXES:  
-0.67425 -0.00106 -0.73851  
0.00076 1.00000 -0.00213  
0.73851 -0.00200 -0.67424

ROTATION ANGLES from TORSO\_ROLL\_FIXED orientation to PRINCIPAL AXES (degrees):  
angles about x y z 179.819 -47.604 179.910

RADII OF GYRATION with respect to PRINCIPAL AXES:  
R1 R2 R3 8.4611440e+01 9.2341648e+01 1.0072838e+02 MM

# Torso roll move



VOLUME = 6.1911318e+05 MM<sup>3</sup>  
 SURFACE AREA = 4.4885712e+05 MM<sup>2</sup>  
 AVERAGE DENSITY = 3.9264336e-06 KILOGRAM / MM<sup>3</sup>  
 MASS = 2.4309068e+00 KILOGRAM

CENTER OF GRAVITY with respect to TORSO\_ROLL\_MOVE coordinate frame:  
 X Y Z -1.3438629e+01 -2.4995993e-02 7.3562799e+01 MM

INERTIA with respect to TORSO\_ROLL\_MOVE coordinate frame: (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
 Ixx Ixy Ixz 2.9857616e+04 3.5091583e+01 -1.7677738e+03  
 Iyx Iyy Iyz 3.5091583e+01 3.3034755e+04 1.6047928e+01  
 Izx Izy Izz -1.7677738e+03 1.6047928e+01 6.2111222e+03

INERTIA at CENTER OF GRAVITY with respect to TORSO\_ROLL\_MOVE coordinate frame:  
 (KILOGRAM \* MM<sup>2</sup>)

INERTIA TENSOR:  
 Ixx Ixy Ixz 1.6702798e+04 3.5908153e+01 -4.1709274e+03  
 Iyx Iyy Iyz 3.5908153e+01 1.9440925e+04 1.1578036e+01  
 Izx Izy Izz -4.1709274e+03 1.1578036e+01 5.7721068e+03

PRINCIPAL MOMENTS OF INERTIA: (KILOGRAM \* MM<sup>2</sup>)  
 I1 I2 I3 4.3623453e+03 1.8111835e+04 1.9441649e+04

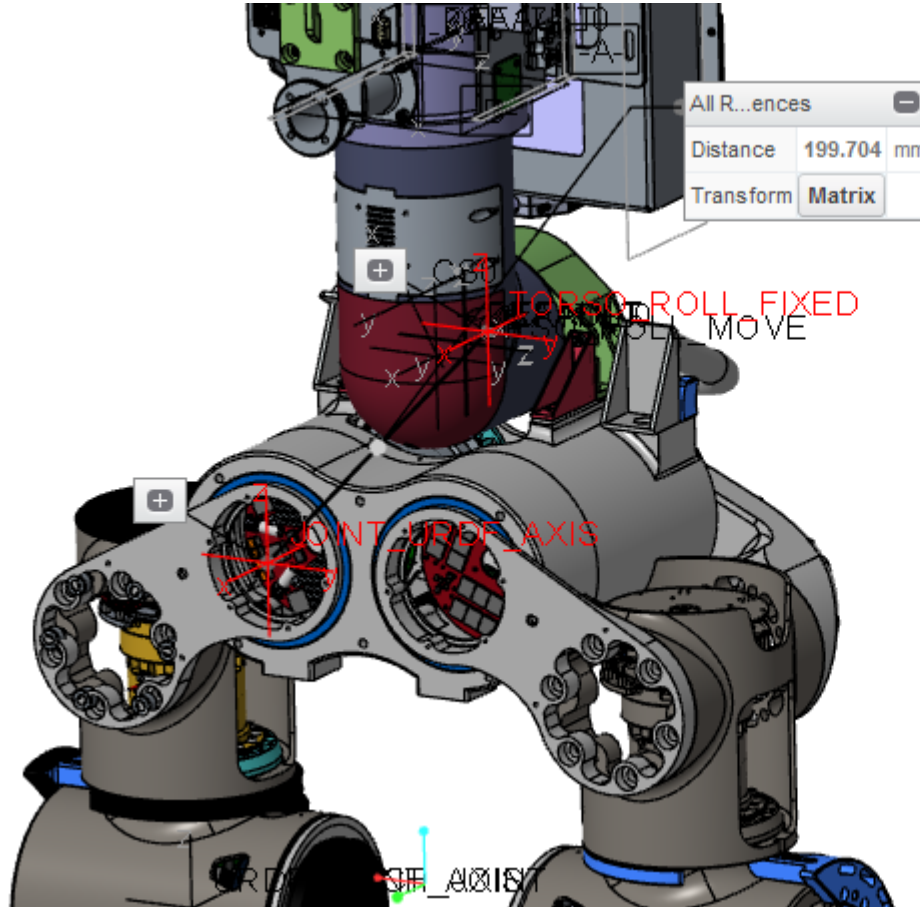
ROTATION MATRIX from TORSO\_ROLL\_MOVE orientation to PRINCIPAL AXES:  
 0.32020 0.94709 0.02208  
 -0.00149 -0.02280 0.99974  
 0.94735 -0.32015 -0.00589

ROTATION ANGLES from TORSO\_ROLL\_MOVE orientation to PRINCIPAL AXES (degrees):  
 angles about x y z -90.338 1.265 -71.320

RADII OF GYRATION with respect to PRINCIPAL AXES:  
 R1 R2 R3 4.2361942e+01 8.6317145e+01 8.9429829e+01 MM



# From Joint\_URDF\_axis to Torso\_roll\_fixed



Measure: Summary

Analysis Feature

Setup

Reference	Options
JOINT_URDF_AXIS:F48(CSYS):HIP_YAW...	
TORSO_ROLL_FIXED:F13(CSYS)	

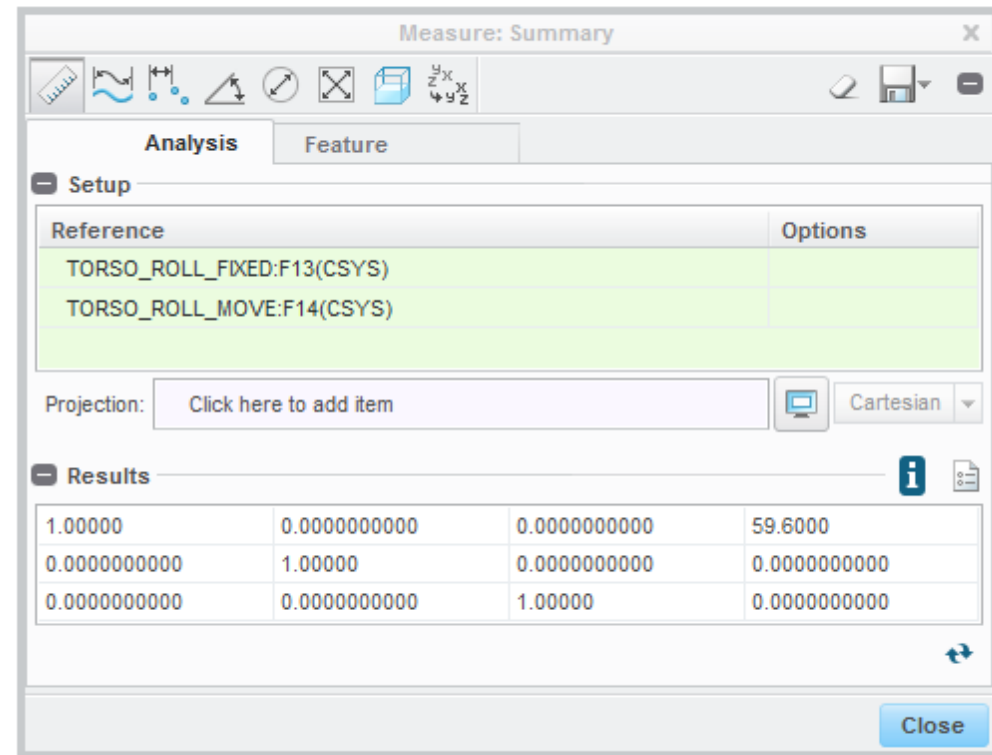
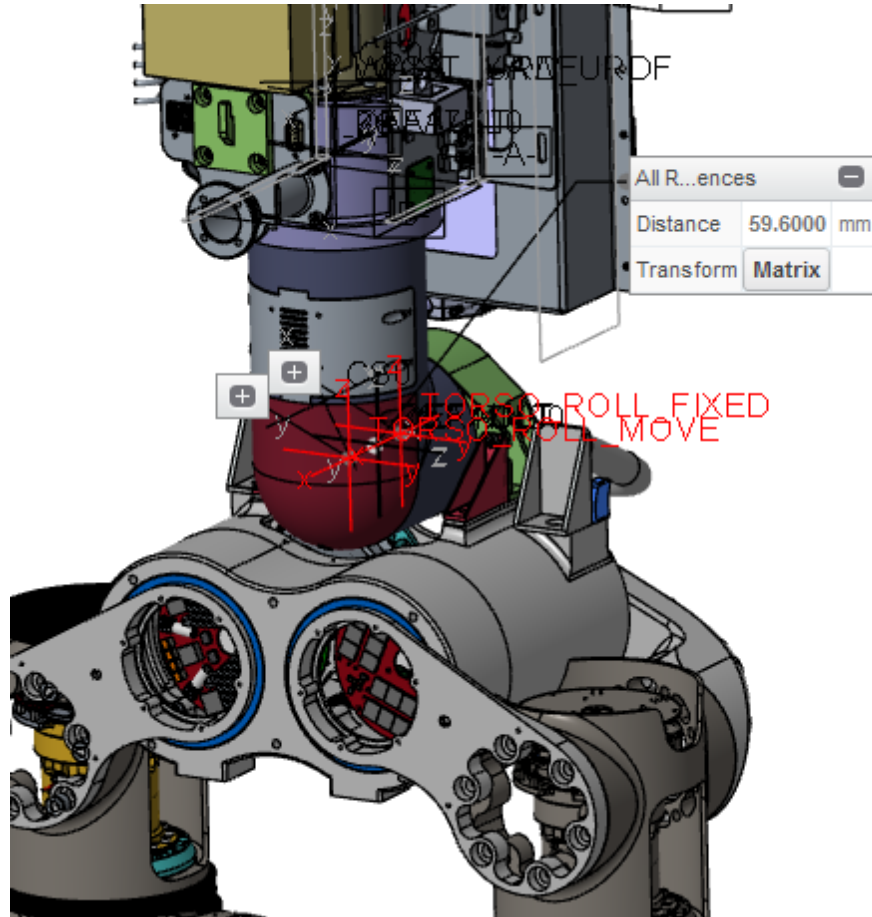
Projection: Click here to add item Cartesian

Results

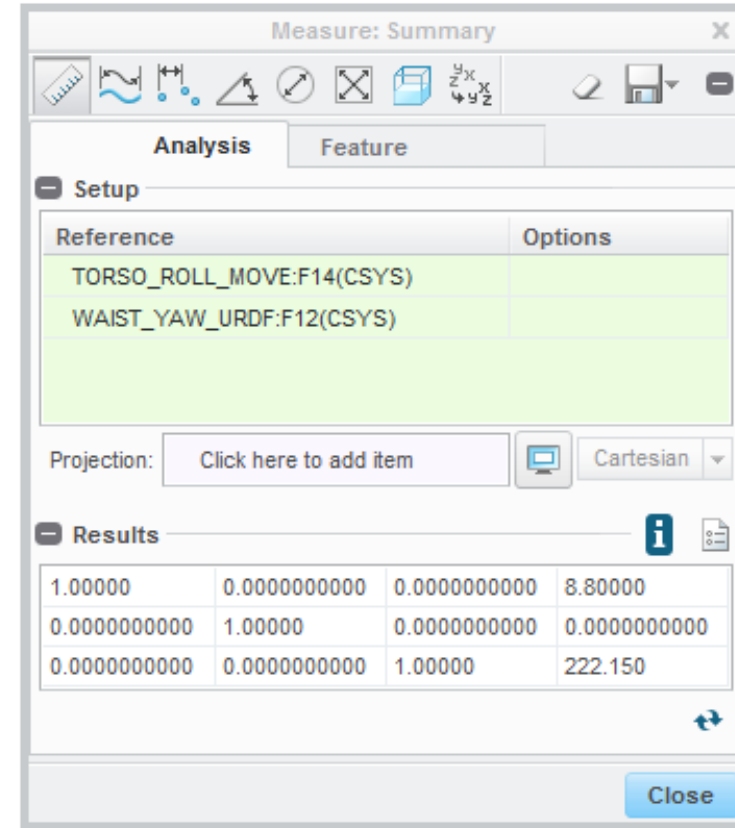
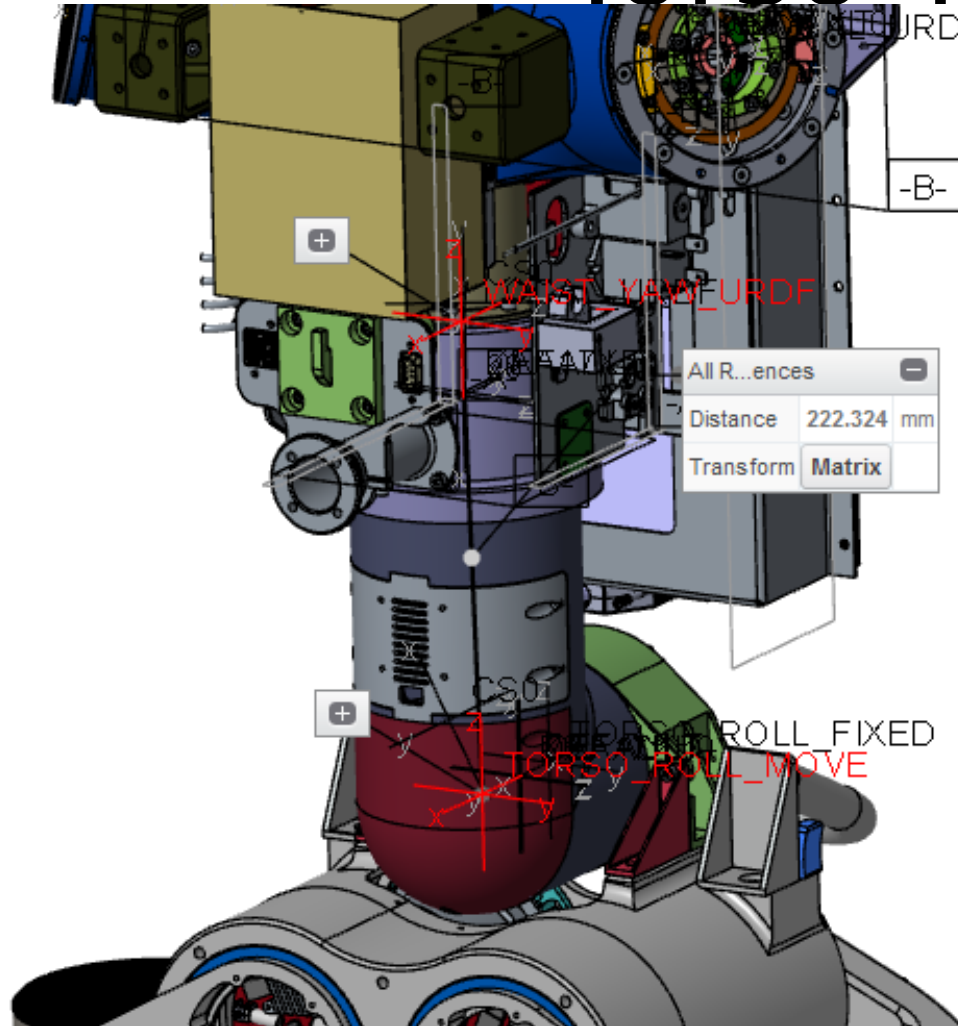
1.00000	0.0000000000	0.0000000000	-156.900
0.0000000000	1.00000	0.0000000000	60.0000
0.0000000000	0.0000000000	1.00000	108.000

Close

# From Torso\_roll\_fixed to Torso\_roll\_move

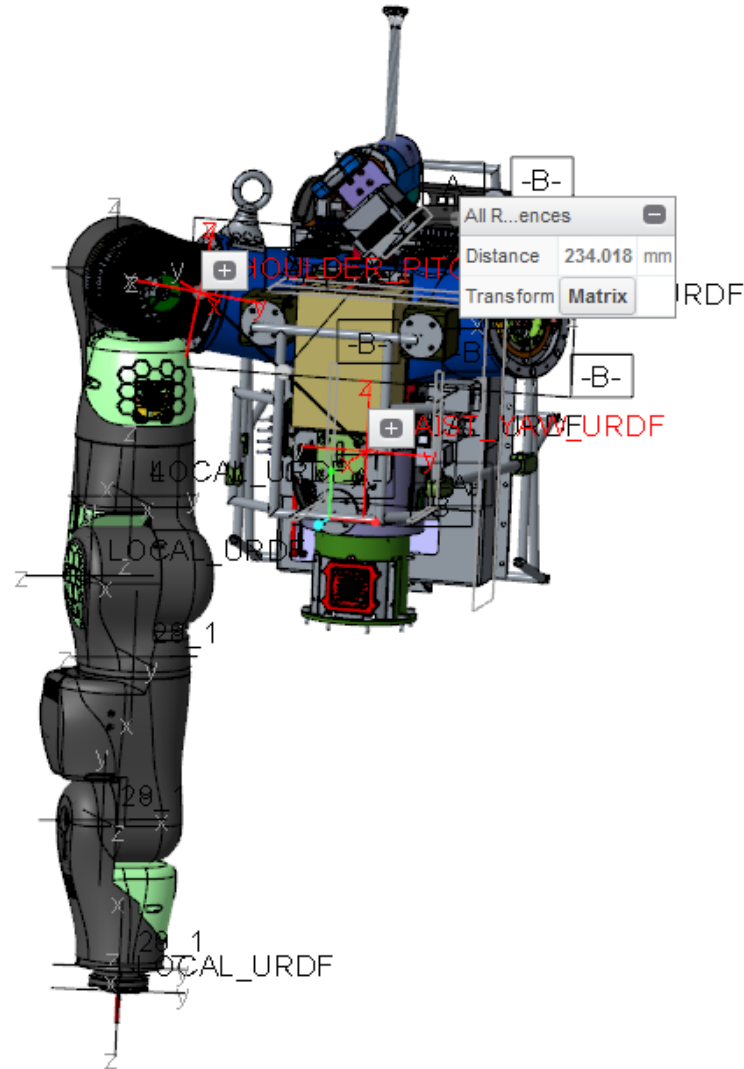


# From Torso\_roll\_move to Torso\_roll\_fixed





# From waist-yaw link to shoulder pitch



Measure: Summary

Analysis Feature

Setup

Reference	Options
WAIST_YAW_URDF:F22(CSYS)	
SHOULDER_PITCH:F24(CSYS)	

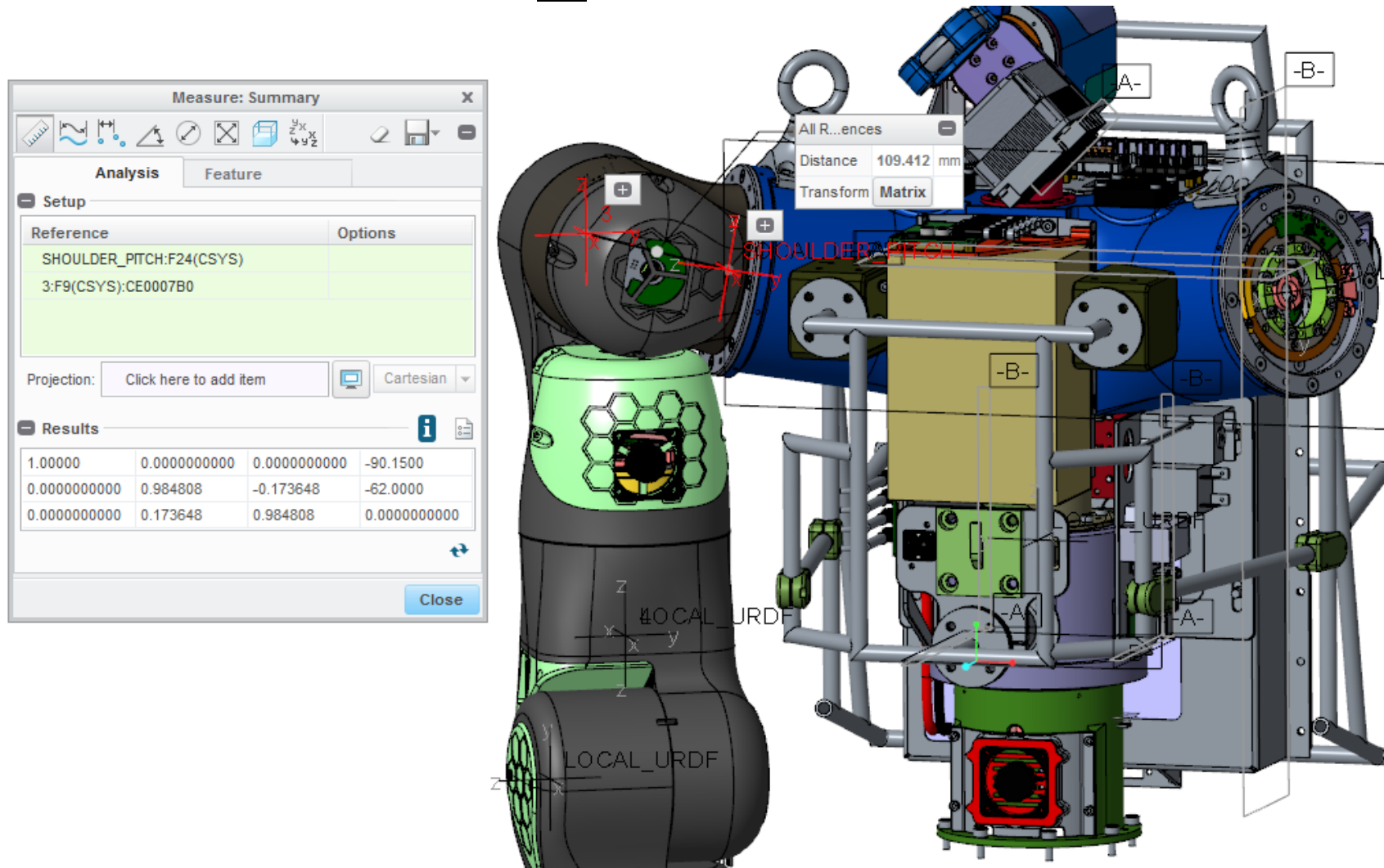
Projection: Click here to add item Cartesian

Results

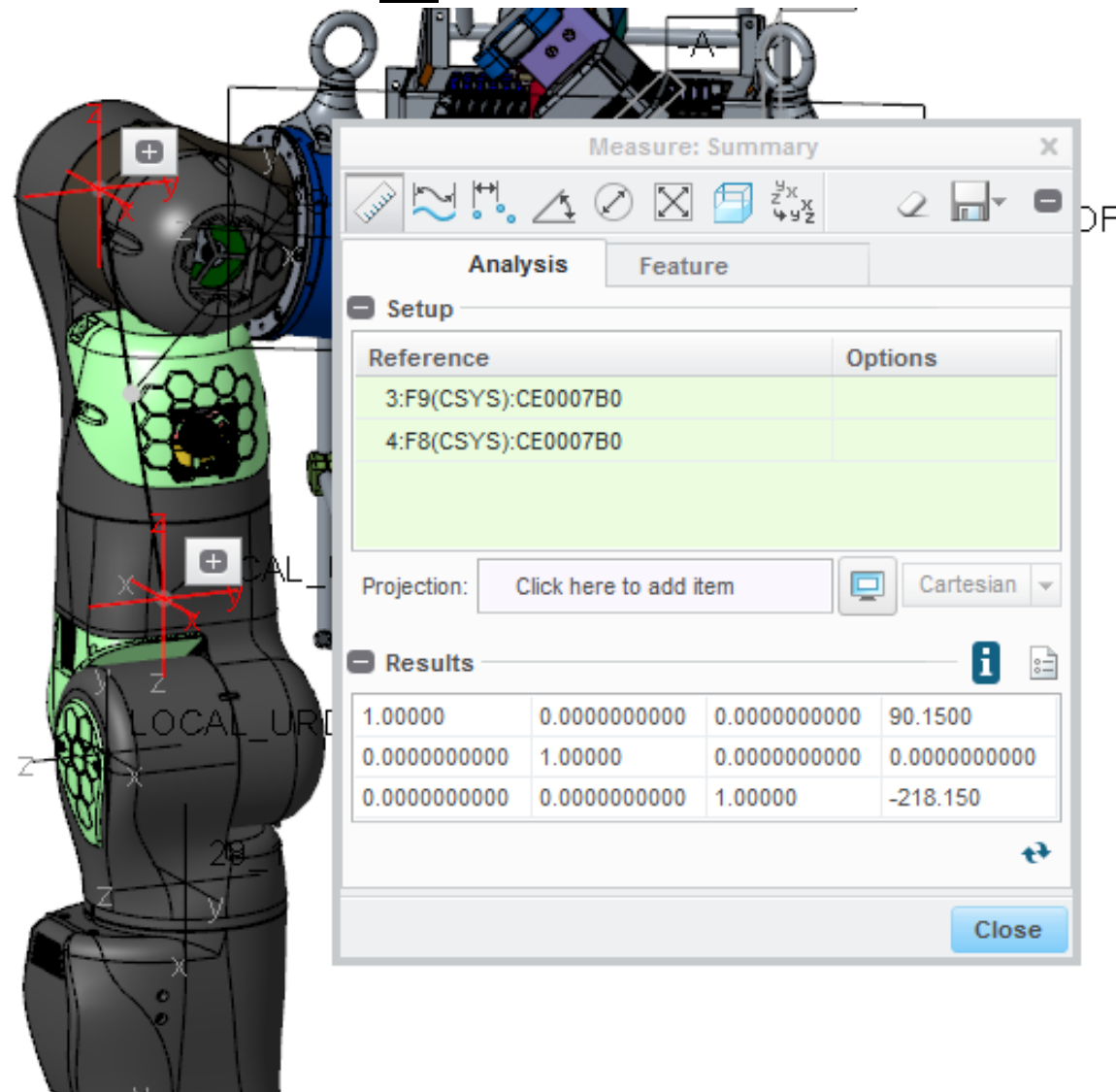
0.866025	-0.492404	-0.0868241	45.7475
0.500000	0.852869	0.150384	-169.137
0.0000000000	-0.173648	0.984808	155.126

Close

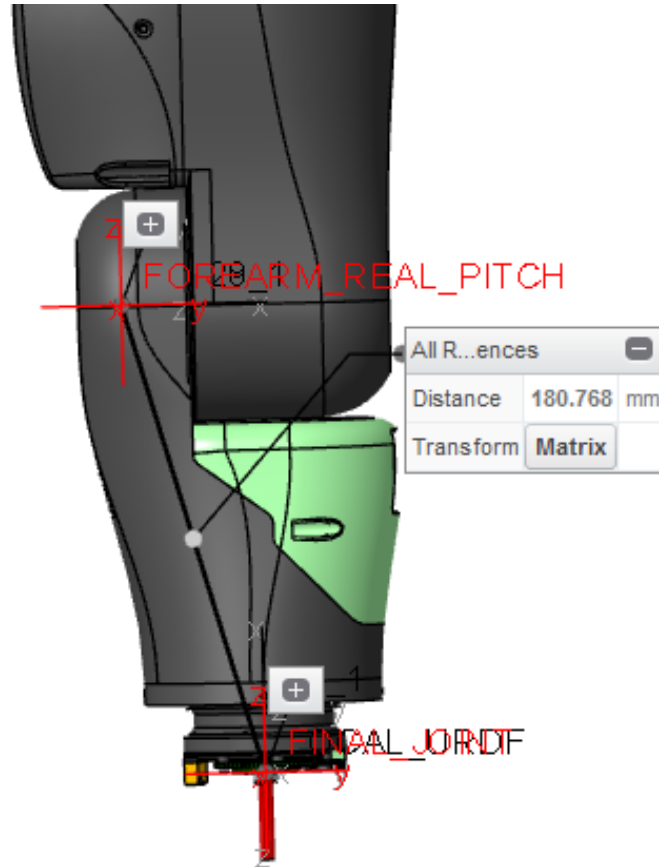
# From shoulder\_pitch to shoulder\_roll



# From shoulder\_roll to shoulder\_yaw



# From forearm pitch to last arm yaw



Measure: Summary

Analysis Feature

Setup

Reference	Options
FOREARM_REAL_PITCH:F28(CSYS)	
FINAL_JOINT:F29(CSYS)	

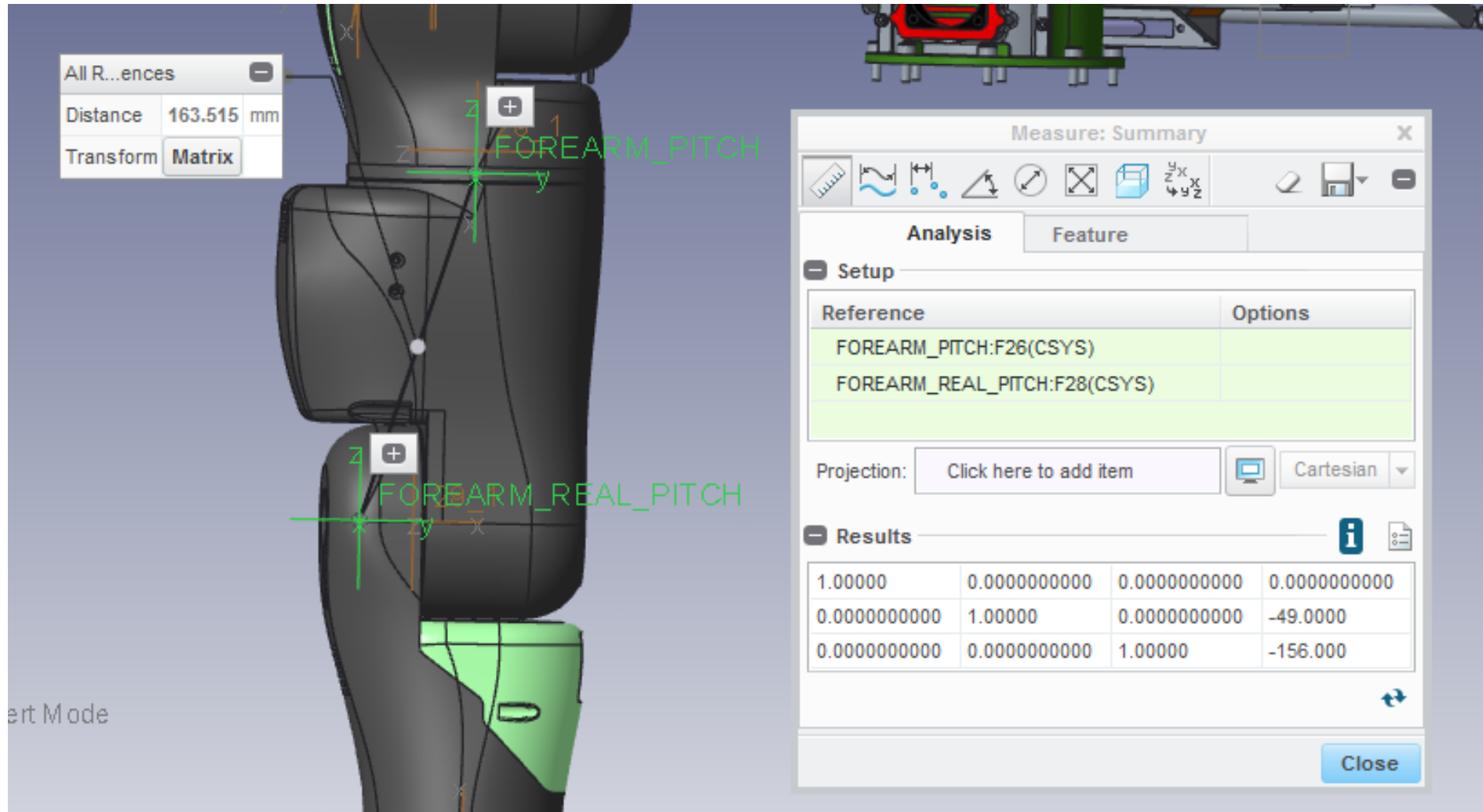
Projection: Click here to add item Cartesian

Results

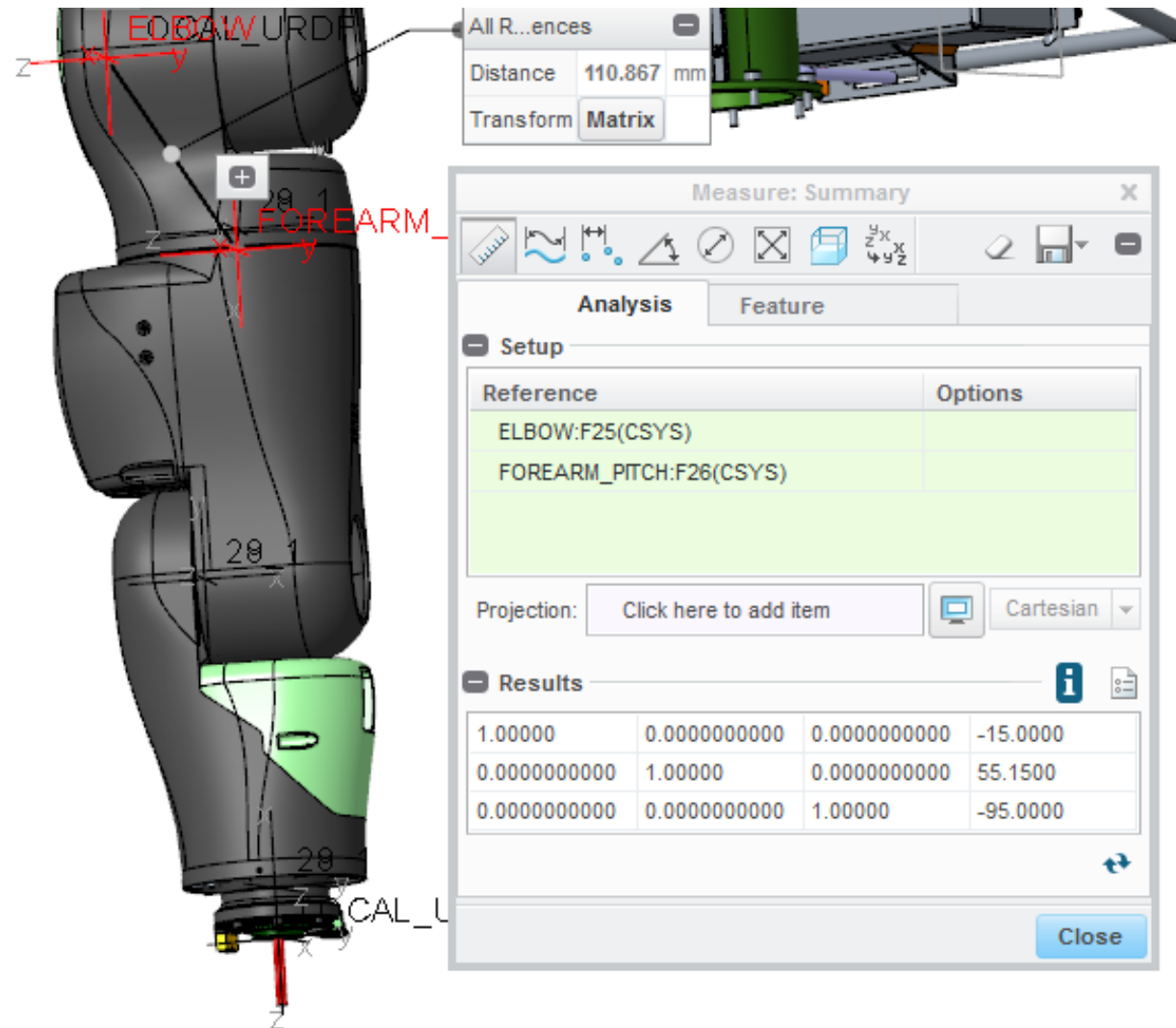
1.00000	0.0000000000	0.0000000000	0.0000000000
0.0000000000	1.00000	0.0000000000	49.0000
0.0000000000	0.0000000000	1.00000	-174.000

Close

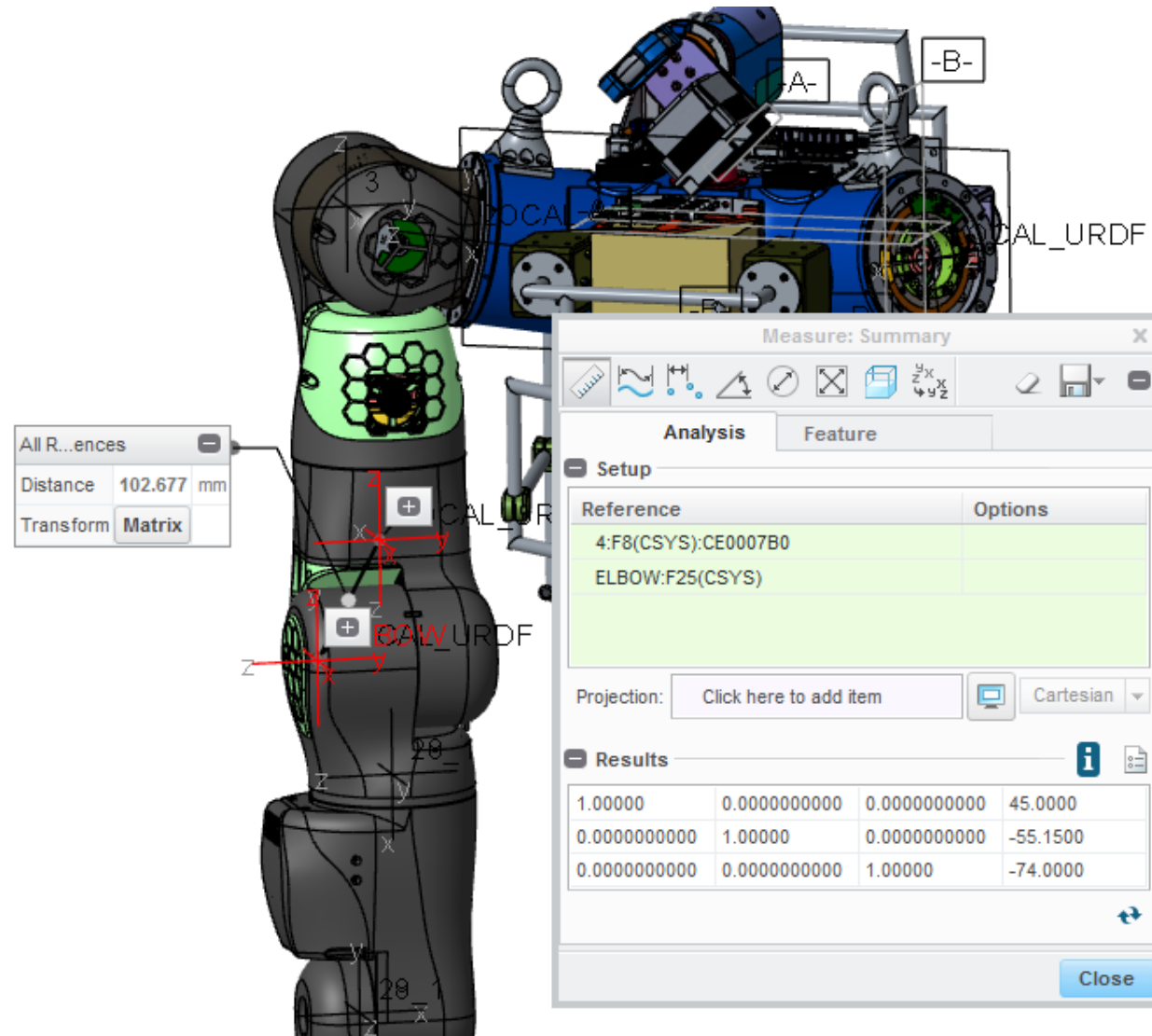
# From forearm yaw to forearm pitch



# From elbow to forearm yaw

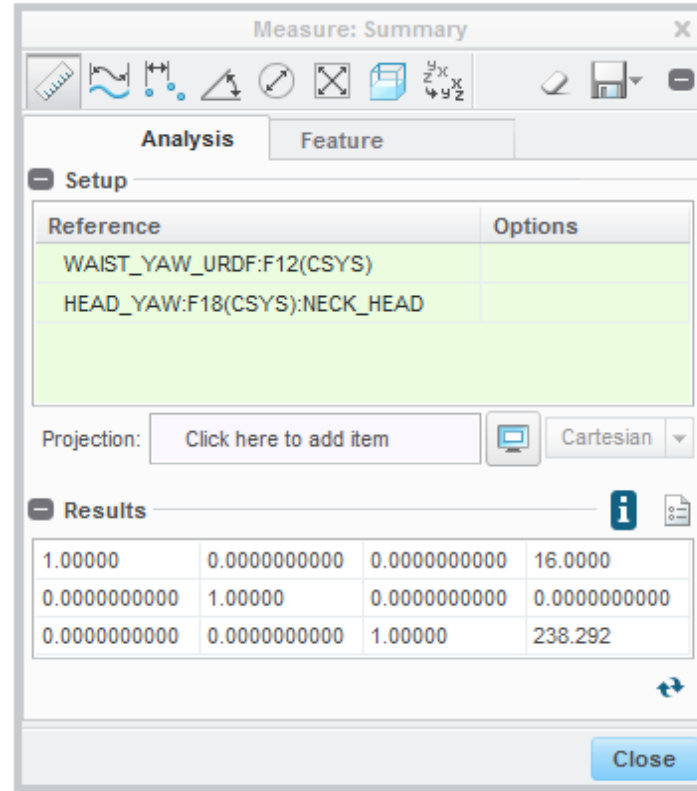
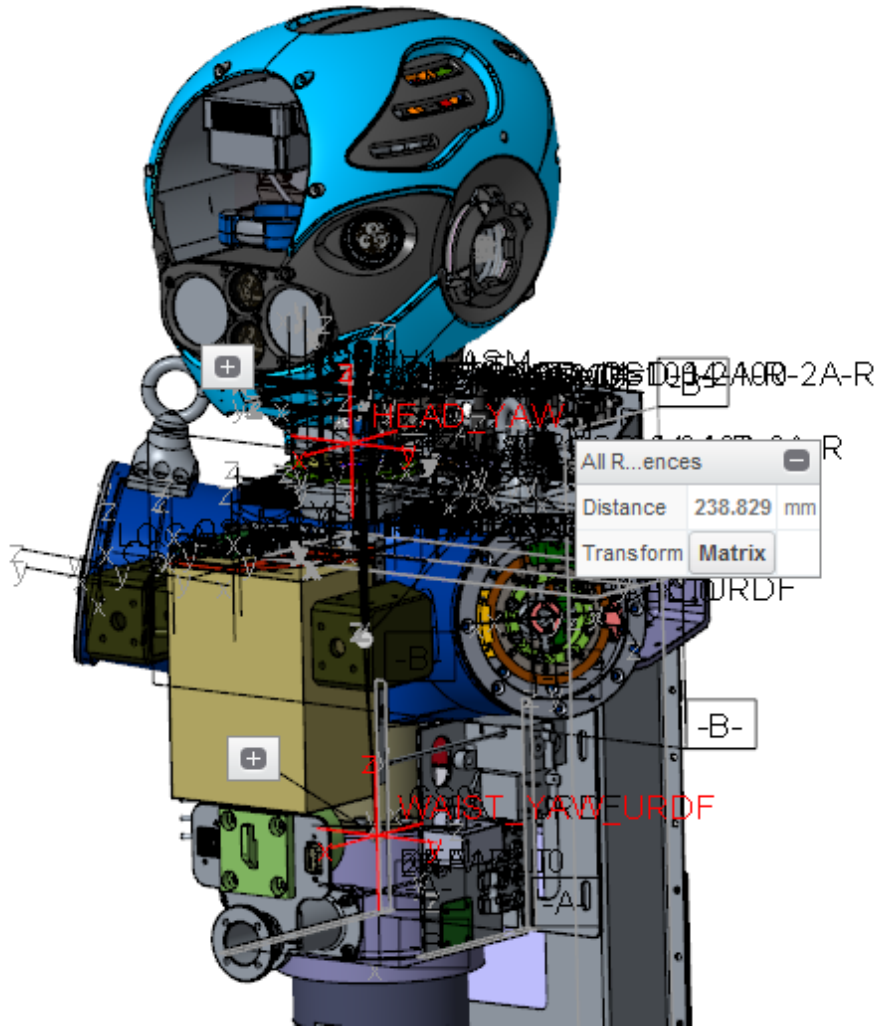


# From shoulder-yaw link elbow





# From Torso\_roll\_move to head\_yaw





# From Torso\_roll\_move to head\_pitch

