



**Human Androgen Receptor  
(NR3C4, AR)  
Reporter Assay System**

**384-well Format Assays**  
Product # IB03002

▪

**Technical Manual**  
*(version 8.0ei)*

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## Human AR Reporter Assay 384-well Format Assays

<b>I. Description</b>	
▪ The Assay System.....	3
▪ The Assay Chemistry.....	3
▪ Considerations for the Preparation and Automated Dispensing of Test Compounds.....	4
▪ Considerations for Automated Dispensing of Other Assay Reagents.....	4
▪ Assay Scheme.....	5
▪ Assay Performance.....	5
<b>II. Product Components &amp; Storage Conditions</b> .....	6
<b>III. Materials to be Supplied by the User</b> .....	6
<b>IV. Assay Protocol</b>	
▪ A word about <i>Antagonist</i> -mode assay setup.....	7
▪ <i>DAY 1 Assay Protocol</i> .....	7
▪ <i>DAY 2 Assay Protocol</i> .....	9
<b>V. Related Products</b> .....	10
<b>VI. Limited Use Disclosure</b> .....	10
<b>APPENDIX 1a:</b> Example Scheme for Serial Dilution when using tip-based dispensing of test compounds.....	11
<b>APPENDIX 1b:</b> Example Scheme for Serial Dilutions when using acoustic dispensing of test compounds.....	12

## I. Description

### ▪ The Assay System ▪

This assay system utilizes proprietary non-human mammalian cells engineered to provide constitutive, high-level expression of full length, unmodified **Human Androgen Receptor** (NR3C4), a ligand-dependent transcription factor commonly referred to as **AR**.

INDIGO's Reporter Cells include the luciferase reporter gene functionally linked to an AR-responsive promoter. Thus, quantifying changes in luciferase expression in the treated reporter cells provides a sensitive surrogate measure of the changes in AR activity. Luciferase gene expression occurs after ligand-bound AR undergoes nuclear translocation, DNA binding, recruitment and assembly of the co-activators and accessory factors required to form a functional transcription complex, culminating in expression of the target gene. Unlike some other cell-based assay strategies, the readout from INDIGO's reporter cells demands the same orchestration of all intracellular molecular interactions and events that can be expected to occur *in vivo*.

Reporter Cells are prepared using INDIGO's proprietary **CryoMite™** process. This cryopreservation method yields exceptional cell viability post-thaw, and provides the convenience of immediately dispensing healthy, division-competent reporter cells into assay plates. There is no need for cumbersome intermediate treatment steps such as spin-and-rinse of cells, viability determinations, cell titer adjustments, or the pre-incubation of reporter cells prior to assay setup.

The principal application of this assay product is in the screening of test samples to quantify functional activities, either agonist or antagonist, that they may exert against the androgen receptor. This is an all-inclusive assay system that includes, in addition to AR Reporter Cells, two optimized media for use during cell culture and in diluting the user's test samples, the reference agonist 6 $\alpha$ -FI-Testosterone, Luciferase Detection Reagent, and a cell culture-ready assay plate.

### ▪ The Assay Chemistry ▪

INDIGO's reporter assays capitalize on the extremely low background, high-sensitivity, and broad linear dynamic range of bio-luminescence reporter gene technology.

Reporter Cells incorporate the cDNA encoding beetle luciferase, a 62 kD protein originating from the North American firefly (*Photinus pyralis*). Luciferase catalyzes the mono-oxidation of D-luciferin in a Mg<sup>+2</sup>-dependent reaction that consumes O<sub>2</sub> and ATP as co-substrates, and yields as products oxyluciferin, AMP, PP<sub>i</sub>, CO<sub>2</sub>, and photon emission. Luminescence intensity of the reaction is quantified using a luminometer and is reported in terms of Relative Light Units (RLU's).

INDIGO's Nuclear Receptor Assays feature a luciferase detection reagent specially formulated to provide stable light emission between 30 and 100+ minutes after initiating the luciferase reaction. Incorporating a 30 minutes reaction-rest period ensures that light emission profiles attain maximal stability, thereby allowing assay plates to be processed in batch. By doing so, the signal output from all sample wells, from one plate to the next, may be directly compared within an experimental set.

▪ **Considerations for the Preparation and Automated Dispensing of Test compounds** ▪

Small molecule compounds are typically solvated at high concentration (ideally 1,000x-concentrated) in DMSO and stored frozen as master stocks. For **384-well format assays** these master stocks will be diluted by one of two alternative methods, the selection of which will be dictated by the type of dispensing instrument that is to be used. This Technical Manual provides detailed protocols for each of these two alternative methods:

- a.) **Tip-based dispensing.** Assay setups in which a conventional tip-based instrument is used to dispense test compounds into assay wells (in black text). Use **Compound Screening Medium (CSM)** to generate a series of **2x-concentration** test compound treatment media, as described in *Step 2a* of the **Assay Protocol**. The final concentration of DMSO carried over into assay reactions should not exceed 0.4%; strive to use 1,000x-concentrated stocks when they are prepared in DMSO.

*NOTE:* CSM is formulated to help stabilize hydrophobic test compounds in the aqueous environment of the assay mixture. Nonetheless, high concentrations of extremely hydrophobic test compounds diluted in CSM may lack long-term stability and/or solubility, especially if further stored at low temperatures. Hence, it is recommended that test compound dilutions are prepared in CSM immediately prior to assay setup and are considered to be 'single-use' reagents.

and,

- b.) **Acoustic transfer dispensing.** Assay setups in which an acoustic transfer device is used to dispense test compounds into assay wells (text highlighted in blue). Use DMSO to make a series of **1,000x-concentrated** test compound stocks that correspond to each desired final assay concentrations, as described in *Step 2b* of the **Assay Protocol**.

▪ **Considerations for Automated Dispensing of Other Assay Reagents** ▪

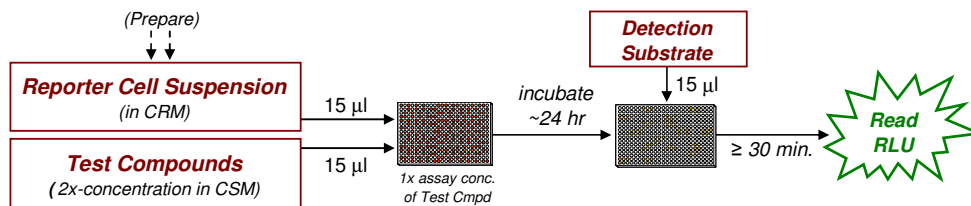
When dispensing into a small number of assay plates, first carefully consider the dead volume requirement of your tip-based dispensing instrument before committing assay reagents to its setup. In essence, "dead volume" is the volume of reagent that is dedicated to the instrument; it will *not* be available for final dispensing into assay wells. The following Table provides information on reagent volume requirements, and available excesses on a *per kit* basis. Always pool the individual reporter cell suspensions and all other respective assay kit reagents before processing multiple 384-well assay plates.

<b>Stock Reagent &amp; Volume provided</b>	<b>Volume to be Dispensed (384-well plate)</b>	<b>Excess rgt. volume available for instrument dead volume</b>
<i>when using tip dispensing of test cmpds</i> <b>Reporter Cell Suspension</b> 7.5 ml	15 µl / well 5.8 ml / plate	~ 1.7 ml
<i>when using acoustic dispensing of test cmpds</i> <b>Reporter Cell Suspension</b> 15 ml	30 µl / well 11.5 ml / plate	~ 3.4 ml
<b>Detection Substrate</b> 7.8 ml	15 µl / well 5.8 ml / plate	~ 2 ml

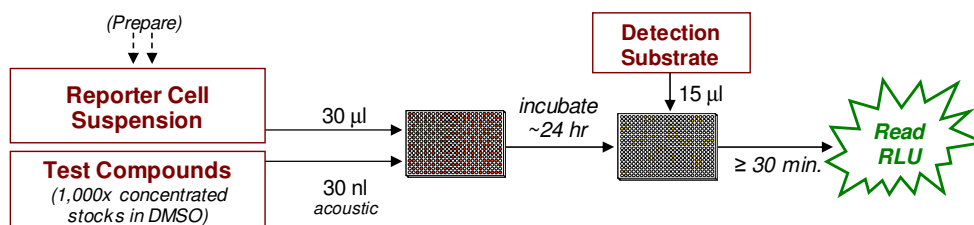
▪ Assay Scheme ▪

The Day 1 preparation, volumes, and chronology of dispensed cells and test compounds are different between assay setups using a *tip-based dispenser* (1a) and those using an *acoustic transfer device* (1b). Following 22 -24 hr incubation Detection Substrate is added. Light emission from each assay well is quantified using a plate-reading luminometer.

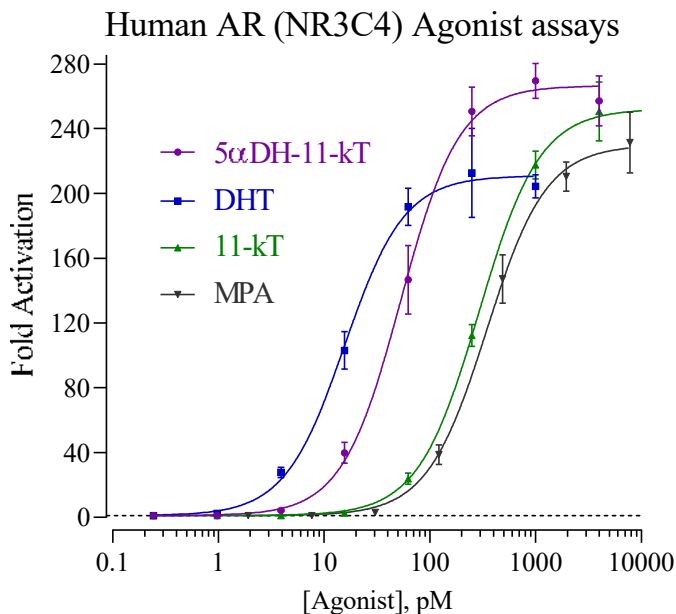
**Figure 1a.** Assay workflow if using conventional **tip-based** dispensing of test compounds.



**Figure 1b.** Assay workflow if using **acoustic** dispensing of test compounds.



▪ Assay Performance ▪



**Figure 2. Response of the AR to reference ligands.** Reporter Cells were treated with reference agonists 5αDihydro 11-keto Testosterone (5αDH-11-kT; provided), Dihydro Testosterone (DHT), 11-keto Testosterone (11-kT) and Medroxy-Progesterone 17-Acetate (MPA). Average Relative Light Units (RLU) and their respective values of Standard Deviation (SD), Coefficient of Variation (CV), and Fold-Activation were calculated for each treatment concentration (n =4). Z' was calculated as per Zhang, *et al.* (1999)<sup>1</sup>.

Values of average Fold-Activation were plotted against Log10 transformed Treatment concentrations (pM) *via* non-linear regression using GraphPad Prism software.

<sup>1</sup> Zhang JH, Chung TD, Oldenburg KR. (1999) A Simple Statistical Parameter for Use in Evaluation and Validation of High Throughput Screening Assays. *J Biomol Screen.*:4(2), 67-73.

$$Z' = 1 - [3 * (SD^{\text{Reference}} + SD^{\text{Vehicle Bkg}}) / (RLU^{\text{Reference}} - RLU^{\text{Vehicle Bkg}})]$$

## II. Product Components & Storage Conditions

This assay kit contains materials to perform assays in a single 384-well assay plate.

**Cryopreserved mammalian cells are temperature sensitive! To ensure maximal viability the tube of Reporter Cells must be maintained at -80°C until immediately prior to the rapid-thaw procedure described in this protocol.**

Assay kits are shipped on dry ice. Upon receipt of the kit transfer it to -80°C storage. If you wish to first inventory the individual kit components be sure to first transfer and submerge the tube of cells in dry ice.

The aliquot of Reporter Cells is provided as a single-use reagent. Once thawed, the cells can NOT be refrozen. Nor can they be maintained in extended culture with any hope of retaining downstream assay performance. Therefore, extra volumes of these reagents should be discarded after assay setup.

The date of product expiration is printed on the Product Qualification Insert (PQI) enclosed with each kit.

<u>Kit Components</u>	<u>Amount</u>	<u>Storage Temp.</u>
▪ AR Reporter Cells	1 x 1.0 mL	<b>-80°C</b>
▪ Cell Recovery Medium (CRM)	1 x 7 mL	-20°C
▪ Compound Screening Medium (CSM)	1 x 35 mL	-20°C
▪ 5 $\alpha$ -Dihydro-11-keto Testosterone (5 $\alpha$ DH-11-kT; 2.0 $\mu$ M in DMSO)	1 x 60 $\mu$ L	-20°C
▪ Detection Substrate	1 x 7.8 mL	<b>-80°C</b>
▪ 384-well assay plate (white, sterile, cell-culture ready)	1	ambient

## III. Materials to be Supplied by the User

The following materials must be provided by the user, and should be made ready prior to initiating the assay procedure:

### DAY 1

- dry ice container
- cell culture-rated laminar flow hood.
- 37°C, humidified 5% CO<sub>2</sub> incubator for mammalian cell culture.
- 37°C water bath.
- 70% alcohol wipes
- electronic, repeat-dispensing pipettes or auto-dispenser suitable for dispensing 15  $\mu$ L.
- disposable media basins, sterile.
- sterile multi-channel media basins *or* deep-well plates, *or* appropriate similar vessel for generating dilution series of reference compound(s) and test compound(s).
- antagonist reference compound (optional).
- acoustic transfer device for dispensing 30 nL (optional).

**DAY 2** plate-reading luminometer.

## IV. Assay Protocol

Review the entire Assay Protocol before starting. Completing the assay requires an overnight incubation. *Steps 1-8* are performed on **Day 1**, requiring less than 2 hours to complete. *Steps 9-13* are performed on **Day 2** and require less than 1 hour to complete.

### ▪ A word about Antagonist-mode assay setup ▪

Receptor inhibition assays expose the Reporter Cells to a fixed, sub-maximal concentration (typically between  $EC_{50}$  –  $EC_{85}$ ) of a known agonist AND varying concentrations of the test compound(s) to be evaluated for antagonist activity. This AR Assay kit includes a 2.0  $\mu$ M stock solution of **5 $\alpha$ -Dihydro-11-keto Testosterone (5 $\alpha$ DH-11-kT)**, a potent agonist of AR that may be used to setup antagonist-mode assays. 100 pM 5 $\alpha$ DH-11-kT typically corresponds to  $\sim EC_{70}$  in this assay and is a suitable concentration of agonist to be used when screening test compounds for inhibitory activity.

Adding the reference agonist to the bulk suspension of Reporter Cells (*i.e.*, prior to dispensing into assay wells) is the most efficient and precise method of setting up antagonist assays, and it is the method presented in *Step 5b* of the protocol when performing tip-based dispensing, and *Step 6b* of the protocol when using an acoustic transfer device to dispense test compounds.

Note that when using a *tip-based instrument* for the dispensing of 2x-concentrated test compounds the cell suspension must also be supplemented with a **2x**-concentration of the challenge agonist.

When using an *acoustic transfer device* for the dispensing of 1,000x-concentrated test compounds the cell suspension should be supplemented with a **1x**-concentration of the challenge agonist.

### DAY 1 Assay Protocol:

All steps must be performed using proper aseptic technique.

- 1.) Remove **Cell Recovery Medium (CRM)** and **Compound Screening Medium (CSM)** from freezer storage and thaw in a 37°C water bath.
- 2.) **Prepare dilutions of treatment compounds:** Prepare Test Compound treatment media for *Agonist-* or *Antagonist-mode* screens. NOTE that test and reference compounds will be prepared differently when using tip-dispensing vs. **acoustic dispensing**. Regardless of the method, the total DMSO carried over into assay reactions should not exceed 0.4%.
  - a. *Tip dispensing method:* In *Step 6*, 15  $\mu$ l / well of the prepared treatment media is added to the assay that has been pre-dispensed with 15  $\mu$ l /well of Reporter Cells. Hence, to achieve the desired *final* assay concentrations one must prepare treatment media with a **2x**-concentration of the test and reference material(s). Use **CSM** to prepare the appropriate dilution series. Plan dilution volumes carefully; this assay kit provides 35 ml of CSM.
  - b. *Acoustic dispensing method:* In *Step 6*, 30 nl / well of **1,000x**-concentrated test compound solutions (prepared in DMSO) are added to the assay plate using an acoustic transfer device.

**Preparing the positive control:** This assay kit includes a 2.0  $\mu$ M stock of **5 $\alpha$ -Dihydro-11-keto Testosterone (5 $\alpha$ DH-11-kT)**, a potent agonist of AR. The following 7-point treatment series, with concentrations presented in 4-fold decrements, provides a complete dose-response: 2000, 500, 125, 31.3, 7.81, 1.95, and 0.488 pM. Always include ‘untreated’ (or ‘Vehicle only’) control wells.

**APPENDIX 1a** provides an example for generating such a dilution series to be used when *tip-dispensing* compound solutions prepared as 2x concentrates in CSM (15  $\mu$ l / well).

**APPENDIX 1b** provides an example for generating such a series of 1,000x-concentrated solutions of compounds prepared in DMSO to be used when performing *acoustic dispensing* (30 nl / well).

**When using *tip-based* instrumentation for dispensing test compounds ...**

**3.)** *First*, retrieve the tube of **CRM** from the 37°C water bath, sanitize the outside with a 70% ethanol swab;

*Second*, retrieve **Reporter Cells** from -80°C storage and immerse in dry ice to transport the tube to a laminar flow hood. Perform a *rapid thaw* of the frozen cells by transferring a **6.5 ml** volume of 37°C CRM into the tube of frozen cells. Recap the tube of Reporter Cells and place it in a 37°C water bath for 5 - 10 minutes. The resulting volume of cell suspension will be 7.5 ml.

**4.)** Retrieve the tube of Reporter Cell Suspension from the water bath. Sanitize the outside surface of the tube with a 70% alcohol swab, then transfer it into the cell culture hood.

**5.)** Gently invert the tube of cell suspension several times to gain a homogenous suspension.

**a. for Agonist-mode assays:** Dispense **15 µl / well** of cell suspension into the Assay Plate.

~ or ~

**b. for Antagonist-mode assays:** Supplement the bulk volume of Reporter Cells suspension with a 2x-concentration of the challenge agonist 5αDH-11-kT (refer to "A word about antagonist-mode assay setup", pg. 7). Dispense **15 µl / well** of cell suspension into the Assay Plate.

**6.)** Dispense **15 µl / well** of 2x-concentrated treatment media (from *Step 2a*) into the assay plate.

**When using an *acoustic transfer* device for dispensing test compounds ...**

**3.)** Dispense **30 nl / well** of the 1,000x-concentrated compounds (in DMSO solutions, from *Step 2b*) into the assay plate.

**4.)** *First*, retrieve the tube of **CRM** from the 37°C water bath, sanitize the outside with a 70% ethanol swab;

*Second*, retrieve **Reporter Cells** from -80°C storage and immerse in dry ice to transport the tube to a laminar flow hood. Perform a *rapid thaw* of the frozen cells by transferring a **6.5 ml** volume of 37°C CRM into the tube of frozen cells. Recap the tube of cells and place it in a 37°C water bath for 5 - 10 minutes. The resulting volume of cell suspension will be 7.5 ml.

**5.)** Retrieve the tube of cell suspension from the water bath. Sanitize the outside surface of the tube with a 70% alcohol swab. Add an additional **7.5 ml** of **CSM** to the tube. The resulting volume of cell suspension will be 15 ml.

**6.)** Gently invert the tube of cells several times to gain a homogenous cell suspension.

**a. for Agonist-mode assays:** Dispense **30 µl / well** of cell suspension into the Assay Plate that has been pre-dispensed with test compounds.

~ or ~

**b. for Antagonist-mode assays:** First supplement the bulk volume of AR Reporter Cells suspension with the challenge agonist 5αDH-11-kT to achieve an EC<sub>50</sub> – EC<sub>80</sub> concentration (refer to "A word about antagonist-mode assay setup", pg. 7). Then dispense **30 µl / well** of the supplemented cell suspension into the assay plate that has been pre-dispensed with test compounds.

*NOTE:* Take special care to prevent cells from settling during the dispensing period. Allowing cells to settle during the transfer process, and/or lack of precision in dispensing uniform volumes across the assay plate *will* cause well-to-well variation (= increased Standard Deviation) in the assay.

(continued ...)



*NOTE:* Following the dispensing of Reporter Cells and test compounds INDIGO recommends performing a *low-speed* spin of the assay plate (with lid) for  $\leq 1$  minute using a room temperature centrifuge fitted with counter-balanced plate carriers.

- 7.) Transfer the assay plate into a cell culture incubator for 22 - 24 hours.

*NOTE:* Ensure a high-humidity ( $\geq 70\%$ ) environment within the cell culture incubator. This is critical to prevent the onset of deleterious "edge-effects" in the assay plate.

- 8.) For greater convenience on *Day 2*, retrieve **Detection Substrate** from freezer storage and place in a dark refrigerator ( $4^{\circ}\text{C}$ ) to thaw overnight.

### **DAY 2 Assay Protocol:**

Subsequent manipulations do *not* require special regard for aseptic technique and may be performed on a bench top.

- 9.) Approximately 30 minutes before intending to quantify receptor activity remove **Detection Substrate** from the refrigerator and place it in a low-light area so that it may equilibrate to room temperature.

*NOTE:* Do NOT actively warm Detection Substrate above room temperature. If this solution was not allowed to thaw overnight at  $4^{\circ}\text{C}$ , a room temperature water bath may be used to expedite thawing.

- 10.) Set the plate-reader to "luminescence" mode. Set the instrument to perform a single 5 second "plate shake" prior to reading the first assay well. Read time may be set to 0.5 second (500 mSec) per well, *or less*.

- 11.) Following 22 - 24 hours of incubation dispense **15  $\mu\text{l}$  / well** of **Detection Substrate** to the assay plate.

*NOTE: Perform this reagent transfer carefully to avoid bubble formation!* Scattered micro-bubbles will not pose a problem. However, bubbles covering the surface of the reaction mix, or large bubbles clinging to the side walls of the well, will cause lens-effects that will degrade the accuracy and precision of the assay data. INDIGO recommends performing a final *low-speed* spin of the assay plate (with lid) for  $\leq 1$  minute using a room temperature centrifuge fitted with counter-balanced plate carriers.

- 12.) Allow the plate(s) to rest at room temperature for 30 minutes. Do not shake the assay plate(s) during this period.

*NOTE:* the luminescent signal is unstable during the first 30 minutes of the luciferase reaction, however, after the initial 30-minute reaction period the luminescence signal achieves a stable emission output.

- 13.) Quantify luminescence.

## V. Related Products

<i>Product No.</i>	<i>Product Descriptions</i>
<b>Human AR Assays</b>	
IB03001-32	Human AR Assay System; 3x 32 assays in 96-well format
IB03001	Human AR Assay System; 1x 96-well format assay
IB03002	Human AR Assay System; 1x 384-well format assays
<b>Rat AR Assays</b>	
R03001-32	Rat AR Assay System; 3x 32 assays in 96-well format
R03001	Rat AR Assay System; 1x 96-well format assay
<b>Zebrafish AR Assays</b>	
Z03001-32	Zebrafish AR Assay System; 3x 32 assays in 96-well format
Z03001	Zebrafish AR Assay System; 1x 96-well format assay

<b>LIVE Cell Multiplex (LCM) Assay</b>	
LCM-01	Reagent volumes sufficient to perform <b>96</b> Live Cell Assays in 1x96-well, or 2x48-well, or 3x32-well assay plate formats
LCM-05	Reagent in <b>5x bulk volume</b> to perform <b>480</b> Live Cell Assays performed in 5 x 96-well assay plates
LCM-10	Reagent in <b>10x bulk volume</b> to perform <b>960</b> Live Cell Assays performed in 10 x 96-well assay plates
<b>INDIGlo Luciferase Detection Reagent</b>	
LDR-10, -25, -50, -500	INDIGlo Luciferase Detection Reagents in 10 mL, 25 mL, 50 mL, and 500 mL volumes

Please refer to INDIGO Biosciences' website for updated product offerings.

[www.indigobiosciences.com](http://www.indigobiosciences.com)

## VI. Limited Use Disclosures

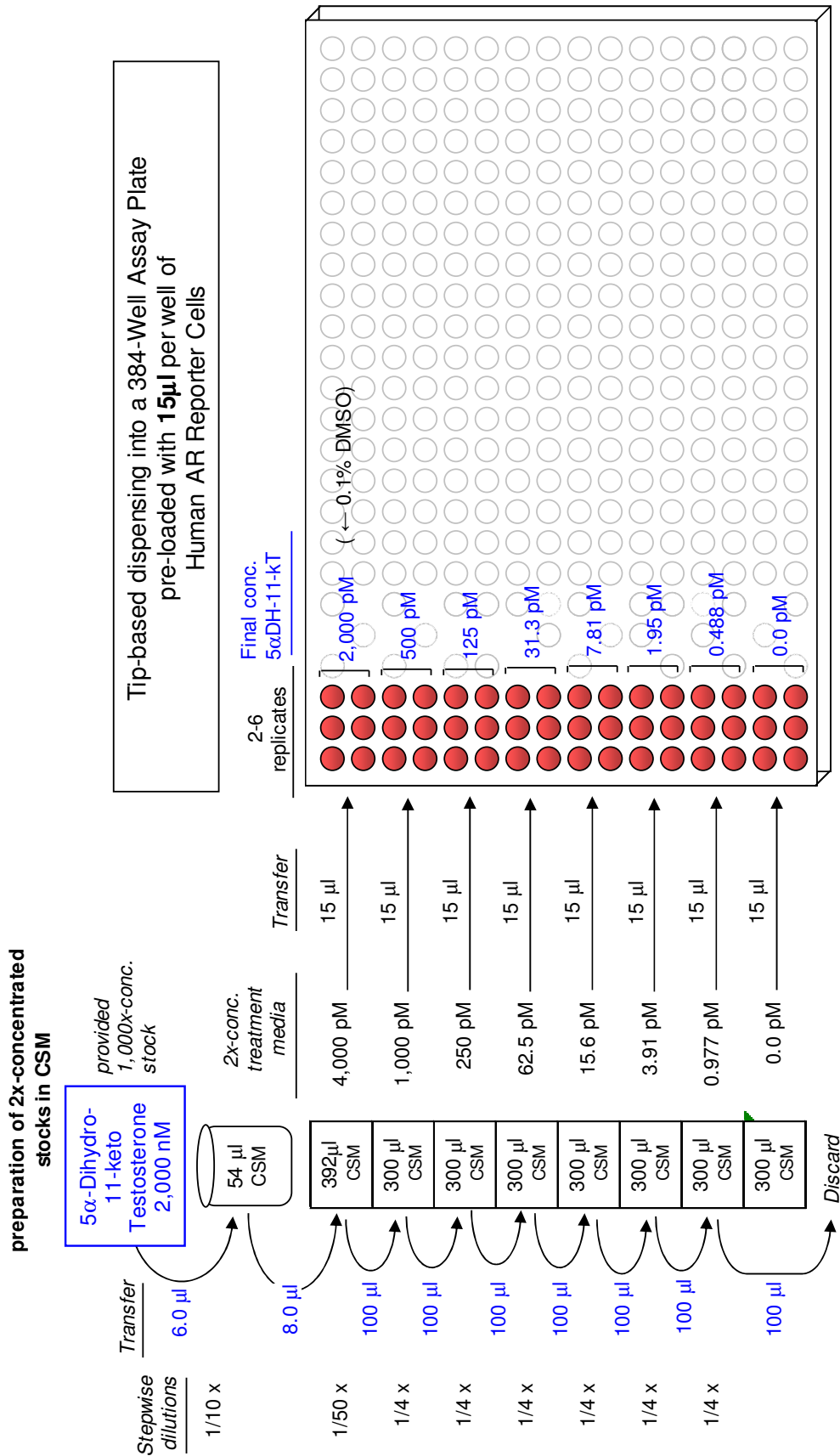
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“CryoMite” is a Trademark <sup>TM</sup> of INDIGO Biosciences, Inc. (State College, PA, USA).

Product prices, availability, specifications, claims and technical protocols are subject to change without prior notice. The printed Technical Manual provided in the kit box will always be the most currently updated version.

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**APPENDIX 1a for tip-based dispensing.** Example scheme for the serial dilution of the reference agonist 5 $\alpha$ -Dihydro-11-keto Testosterone into CSM to generate **2x-concentrated** treatment media. A *tip-based* instrument is used to dispense 15  $\mu$ l / well into an assay plate that has been *pre-dispensed* with 15  $\mu$ l / well of AR Reporter Cells suspension.



**APPENDIX 1b for acoustic dispensing.** Example scheme for the serial dilution of the reference agonist 5 $\alpha$ -Dihydro-11-keto Testosterone into DMSO to generate **1,000x-concentrated** stocks. 30 nl / well are pre-dispensed into an *empty* assay plate using an acoustic transfer device.

